MVME177P Single-Board Computer

Installation and Use

V177PA/IH1

Edition of October 2000

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The following general safety precautions must be observed during all phases of operation, service, and repair of this equipment. Failure to comply with these precautions or with specific warnings elsewhere in this manual could result in personal injury or damage to the equipment.

The safety precautions listed below represent warnings of certain dangers of which Motorola is aware. You, as the user of the product, should follow these warnings and all other safety precautions necessary for the safe operation of the equipment in your operating environment.

Ground the Instrument.

To minimize shock hazard, the equipment chassis and enclosure must be connected to an electrical ground. If the equipment is supplied with a three-conductor AC power cable, the power cable must be plugged into an approved three-contact electrical outlet, with the grounding wire (green/yellow) reliably connected to an electrical ground (safety ground) at the power outlet. The power jack and mating plug of the power cable meet International Electrotechnical Commission (IEC) safety standards and local electrical regulatory codes.

Do Not Operate in an Explosive Atmosphere.

Do not operate the equipment in any explosive atmosphere such as in the presence of flammable gases or fumes. Operation of any electrical equipment in such an environment could result in an explosion and cause injury or damage.

Keep Away From Live Circuits Inside the Equipment.

Operating personnel must not remove equipment covers. Only Factory Authorized Service Personnel or other qualified service personnel may remove equipment covers for internal subassembly or component replacement or any internal adjustment. Service personnel should not replace components with power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, such personnel should always disconnect power and discharge circuits before touching components.

Use Caution When Exposing or Handling a CRT.

Breakage of a Cathode-Ray Tube (CRT) causes a high-velocity scattering of glass fragments (implosion). To prevent CRT implosion, do not handle the CRT and avoid rough handling or jarring of the equipment. Handling of a CRT should be done only by qualified service personnel using approved safety mask and gloves.

Do Not Substitute Parts or Modify Equipment.

Do not install substitute parts or perform any unauthorized modification of the equipment. Contact your local Motorola representative for service and repair to ensure that all safety features are maintained.

Observe Warnings in Manual.

Warnings, such as the example below, precede potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed. You should also employ all other safety precautions which you deem necessary for the operation of the equipment in your operating environment.

Warning

To prevent serious injury or death from dangerous voltages, use extreme caution when handling, testing, and adjusting this equipment and its components.

Flammability

All Motorola PWBs (printed wiring boards) are manufactured with a flammability rating of 94V-0 by UL-recognized manufacturers.

EMI Caution

Caution

This equipment generates, uses and can radiate electromagnetic energy. It may cause or be susceptible to electromagnetic interference (EMI) if not installed and used with adequate EMI protection.

Lithium Battery Caution

This product contains a lithium battery to power the clock and calendar circuitry.

Caution

Danger of explosion if battery is replaced incorrectly. Replace battery only with the same or equivalent type recommended by the equipment manufacturer. Dispose of used batteries according to the manufacturer's instructions.

Attention

Il y a danger d'explosion s'il y a remplacement incorrect de la batterie. Remplacer uniquement avec une batterie du même type ou d'un type équivalent recommandé par le constructeur. Mettre au rebut les batteries usagées conformément aux instructions du fabricant.

Vorsicht

Explosionsgefahr bei unsachgemäßem Austausch der Batterie. Ersatz nur durch denselben oder einen vom Hersteller empfohlenen Typ. Entsorgung gebrauchter Batterien nach Angaben des Herstellers.

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>
> EN50082-1:1997 “Electromagnetic Compatibility—Generic Immunity Standard, Part 1. Residential, Commercial and Light Industry”

System products also fulfill EN60950 (product safety) which is essentially the requirement for the Low Voltage Directive (73/23/EEC).

Board products are tested in a representative system to show compliance with the above mentioned requirements. A proper installation in a CE-marked system will maintain the required EMC/safety performance.

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About This Manual

This manual provides general information, preparation for use and installation instructions, operating instructions, and functional description for the MVME177P series of Single Board Computers (referred to as the MVME177P throughout this manual).

The “Petra” chip that distinguishes MVME177P single-board computers is an application-specific integrated circuit (ASIC) used on various Motorola VME boards which combines a variety of functions previously implemented in other ASICs (among them the MC2 chip, the IP2 chip, and the MCECC chip) in a single ASIC. On the MVME177P, the “Petra” chip replaces the MCECC ASIC.

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Model Number	Characteristics
MVME177PA-54SE	50MHz MC68060, 16MB SDRAM, SCSI and Ethernet
MVME177PA-55SE	50MHz MC68060, 32MB SDRAM, SCSI and Ethernet
MVME177PA-56SE	50MHz MC68060, 64MB SDRAM, SCSI and Ethernet
MVME177PA-64SE	60MHz MC68060, 16MB SDRAM, SCSI and Ethernet
MVME177PA-65SE	60MHz MC68060, 32MB SDRAM, SCSI and Ethernet
MVME177PA-66SE	60MHz MC68060, 64MB SDRAM, SCSI and Ethernet
MVME177PA-67SE	60MHz MC68060, 128MB SDRAM, SCSI and Ethernet

This manual is intended for anyone who designs OEM systems, adds capability to an existing compatible system, or works in a lab environment for experimental purposes. A basic knowledge of computers and digital logic is assumed. To use this manual, you may also wish to become familiar with the publications listed in the *Related Documentation* section in Appendix E.

Overview of Contents

Chapter 1, *Hardware Preparation and Installation*, provides unpacking instructions, hardware preparation guidelines, and installation instructions for the MVME177P single-board computer.

Chapter 2, *Startup and Operation*, provides information on powering up the MVME177P single-board computer after its installation in a system and describes the functionality of the switches, status indicators, and I/O ports.

Chapter 3, *177Bug Firmware*, describes the basics of 177Bug and its architecture, describes the monitor (interactive command portion of the firmware) in detail, and gives information on using the debugger and special commands.

Chapter 4, *Functional Description*, describes the MVME177P single-board computer on a block diagram level.

Chapter 5, *Pin Assignments*, summarizes the pin assignments for the various groups of interconnect signals on the MVME177P.

Appendix A, *Specifications*, lists the general specifications for the MVME177P single-board computer. Subsequent sections of the appendix detail cooling requirements and EMC regulatory compliance.

Appendix B, *Troubleshooting*, includes simple troubleshooting steps to follow in the event that you have difficulty with your MVME177P single-board computer.

Appendix C, *Network Controller Data*, describes the VMEbus network controller modules that are supported by the 177Bug firmware.

Appendix D, *Disk/Tape Controller Data*, describes the VMEbus disk/tape controller modules that are supported by the 177Bug firmware.

Appendix E, *Related Documentation*, lists all documentation related to the MVME177P.

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In all your correspondence, please list your name, position, and company. Be sure to include the title and part number of the manual and tell how you used it. Then tell us your feelings about its strengths and weaknesses and any recommendations for improvements.

Conventions Used in This Manual

The following typographical conventions are used in this document:

$	dollar	specifies a hexadecimal number
%	percent	specifies a binary number
&	ampersand	specifies a decimal number

Unless otherwise specified, all address references are in hexadecimal.

An asterisk (*) following the signal name for signals which are level significant denotes that the signal is true or valid when the signal is low.

An asterisk (*) following the signal name for signals which are edge significant denotes that the actions initiated by that signal occur on high to low transition.

bold

is used for user input that you type just as it appears; it is also used for commands, options and arguments to commands, and names of programs, directories and files.

italic

is used for names of variables to which you assign values. Italic is also used for comments in screen displays and examples, and to introduce new terms.

`courier`

is used for system output (for example, screen displays, reports), examples, and system prompts.

<**Enter**>, <**Return**> or <**CR**>

<**CR**> represents the carriage return or Enter key.

CTRL

represents the Control key. Execute control characters by pressing the Ctrl key and the letter simultaneously, for example, **Ctrl-d**.

Hardware Preparation and Installation

1

Introduction

This chapter provides unpacking instructions, hardware preparation guidelines, and installation instructions for the MVME177P Single Board Computer.

Getting Started

This section supplies an overview of startup procedures applicable to teh MVME177P. Equipment requirements, directions for unpacking, and ESD precautions that you should take to complete the section.

Overview of Installation Procedure

The following table identifies the things you will need to do to use this board, and tells where to find the information you need to perform each step. Be sure to read this entire chapter, including all Cautions and Warnings, before you begin.

Table 1-1. Startup Overview

What you need to do...	Refer to...
Unpack the hardware.	*Guidelines for Unpacking* on page 1-3
Reconfigure jumpers or switches on the MVME177P board as necessary.	*Preparing the Board* on page 1-4
Reconfigure jumpers or switches on the MVME712 series transition module as necessary.	*Preparing the Transition Module* on page 1-11
Install the board and transition module in a chassis.	*Installation Instructions* on page 1-11
Connect a display terminal.	*Installation Instructions* on page 1-11

Table 1-1. Startup Overview

What you need to do...	Refer to...
Connect any other equipment you will be using.	*Installation Instructions* on page 1-11
Power up the system.	*Applying Power* on page 2-3
	Solving Startup Problems on page B-1
Note that the firmware initializes and tests the board.	*Bringing up the Board* on page 2-5
	You may also wish to obtain the 177Bug Firmware User's Manual, listed in Appendix E, *Related Documentation*.
Initialize the system clock.	*Debugger Commands* on page 3-5
Examine and/or change environmental parameters.	*Modifying the Environment* on page 3-8
Program the board as needed for your applications.	Programmer's Reference Guide, listed in Appendix E, *Related Documentation*.

Equipment Required

The following equipment is required to make a complete system using the MVME177P:

- VME system enclosure
- System console terminal
- Operating system (and / or application software)
- Disk drives (and / or other I/O) and controllers
- MVME712 series transition module, connecting cables and P2 or LCP2 adapter

Guidelines for Unpacking

Note If the shipping carton is damaged upon receipt, request that the carrier's agent be present during the unpacking and inspection of the equipment.

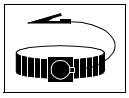
Unpack the equipment from the shipping carton. Refer to the packing list and verify that all items are present. Save the packing material for storing and reshipping of equipment.

Caution Avoid touching areas of integrated circuitry; static discharge can damage circuits.

ESD Precautions

This section applies to all hardware installations you may perform that involve the MVME177P board.

Use ESD



Wrist Strap

Motorola strongly recommends the use of an antistatic wrist strap and a conductive foam pad when you install or upgrade the board. Electronic components can be extremely sensitive to ESD. After removing the board from the chassis or from its protective wrapper, place the board flat on a grounded, static-free surface, component side up. Do not slide the board over any surface.

If no ESD station is available, you can avoid damage resulting from ESD by wearing an antistatic wrist strap (available at electronics stores). Place the strap around your wrist and attach the grounding end (usually a piece of copper foil or an alligator clip) to an electrical ground. An electrical ground can be a piece of metal that literally runs into the ground (such as an unpainted metal pipe) or a metal part of a grounded electrical appliance. An appliance is grounded if it has a three-prong plug and is plugged into a three-prong grounded outlet. You cannot use the chassis in which you are installing the MVME177P itself as a ground, because the enclosure is unplugged while you work on it.

Turn the system's power off before you perform these procedures. Failure to turn the power off before opening the enclosure can result in personal injury or damage to the equipment. Hazardous voltage, current, an denergy levels are present in the chassis. Hazardous voltages may be present on power switch terminals even when the power switch is off. Never operate the system with the cover removed. Always replace the cover before powering up the system.

Preparing the Board

To produce the desired configuration and ensure proper operation of the MVME177P, you may need to reconfigure hardware to some extent before installating the board.

Most options on the MVME177P are under software control: By setting bits in control registers after installing the module in a system, you can modify its configuration. (The MVME177P registers are described in Chapter 3 under *ENV – Set Environment*, and/or in the *Programmer's Reference Guide* as listed under "Related Documentation" in Appendix E.)

Some options, though, are not software-programmable. Such options are either set by configuration switches or are controlled through physical installation or removal of header jumpers on the base board.

MVME177P Configuration

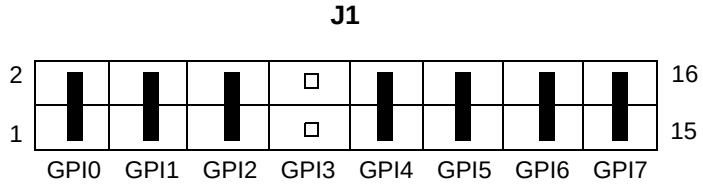
Figure 1-1 illustrates the placement of the jumper headers, connectors, configuration switches, and various other components on the MVME177P. Manually configurable jumper headers and configuration switches on the MVME177P are listed in the following table.

Table 1-2. MVME177P Configuration Settings

Function	Factory Default
General Purpose Readable Jumpers (J1)	No jumper on 7-8
VME System Controller (J6)	1-2
SRAM Backup Power Source (J9)	1-3, 2-4
Serial Port 4 Clock Configuration (J10 and J11)	2-3, 2-3
Petra SDRAM Size (S3)	Varies
Board EPROM/Flash Mode (S4)	On-Off

General Purpose Readable Jumpers (J1)

Each MVME177P may be configured with readable jumpers. These jumpers can be read as a register (at address $FFF40088) in the VMEchip2 Local Control/Status register (refer to the *Programmer's Reference Guide* for details). The bit values are read as a **1** when the jumper is off, and as a **0** when the jumper is on. The MVME177P is shipped from the factory with all jumpers installed except GPI3 (pins 7-8), as diagrammed below.



All Zeros but GPI3 (Factory Configuration)

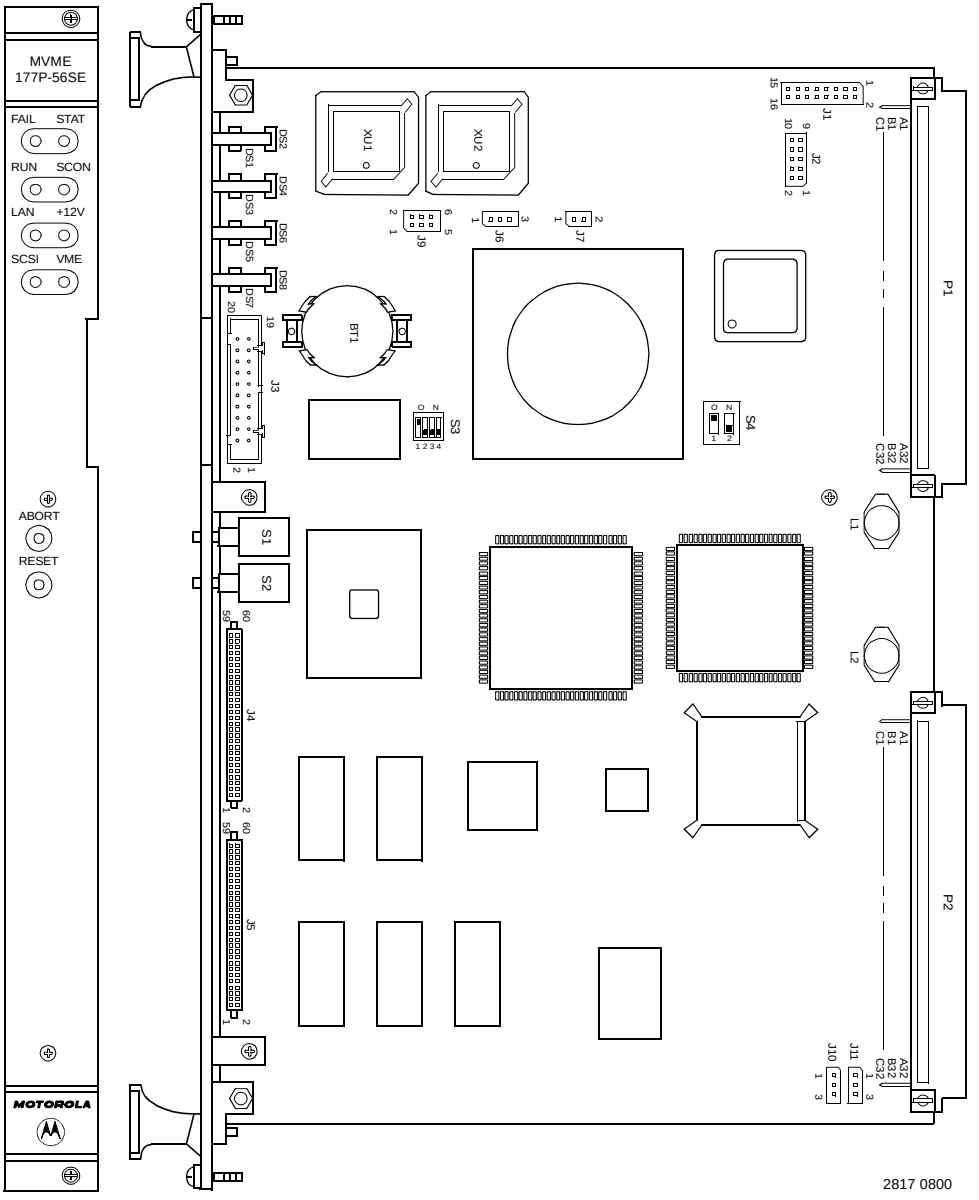
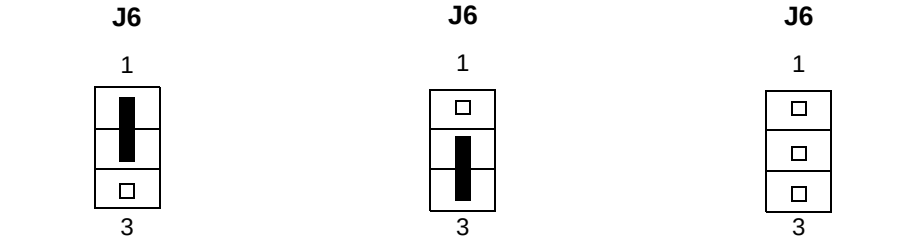


Figure 1-1. MVME177P Board Layout

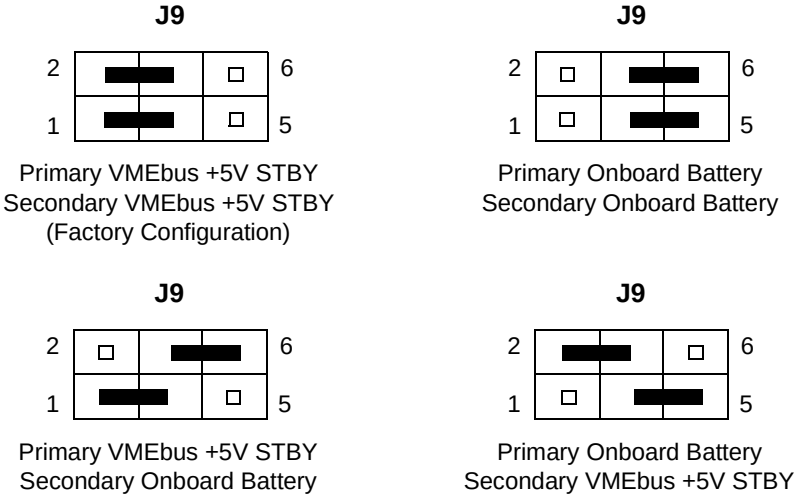
VME System Controller (J6)

The MVME177P can be VMEbus system controller. The system controller function is enabled/disabled by jumpers on header J6. When the MVME177P is system controller, the SCON LED is turned on. The VMEchip2 may be configured as a system controller as follows.



SRAM Backup Power Source (J9)

Header J9 determines the source for onboard static RAM backup power on the MVME177P. In the factory configuration, VMEbus +5V standby voltage serves as primary and secondary power source (the onboard battery is disconnected). The backup power configurations available for onboard SRAM through header J9 are illustrated in the following diagram.

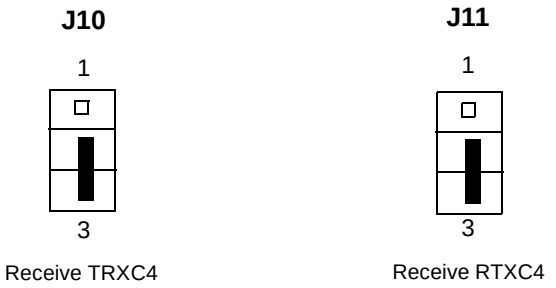


Caution

Removing all jumpers may temporarily disable the SRAM. Do not remove all jumpers from J9, except for storage.

Serial Port 4 Clock Configuration (J10 and J11)

Serial port 4 can be configured to use clock signals provided by the RTXC4 and TRXC4 signal lines. Headers J10 and J11 on the MVME177P configure serial port 4 to drive or receive TRXC4 and RTXC4, respectively. The factory configuration has port 4 set to receive both signals.



(Factory Configurations)

Petra SDRAM Size (S3)

MVME177P boards use SDRAM (Synchronous DRAM) in place of DRAM. For compatibility with user applications, the MVME177P's SDRAM is configurable to emulate 4MB, 8MB, 16MB, 32MB, 64MB, or 128MB ECC-protected DRAM. Board configuration is a function of switch settings and resistor population options.

S3 is a four-segment slide switch whose lower three segments establish the size of the ECC DRAM memory model (segment 4 is not used.) Refer to the illustration and table below for specifics.

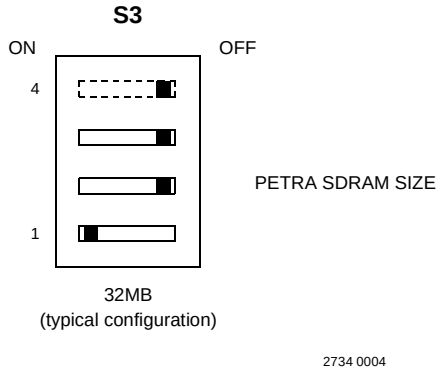


Table 1-3. Petra SDRAM Size Settings

S3 Segment 1	S3 Segment 2	S3 Segment 3	MCECC DRAM Size
ON	ON	ON	4MB
ON	ON	OFF	8MB
ON	OFF	ON	16MB
ON	OFF	OFF	32MB
OFF	ON	ON	64MB
OFF	ON	OFF	128MB

Note As shown in the preceding table, the MVME177P Petra/MCECC interface supports on-board ECC DRAM emulations up to 128MB. For sizes beyond 128MB, the MVME177P accommodates memory mezzanines of the types used on previous MVME177 boards. One additional mezzanine can be plugged in to provide up to 128MB of additional DRAM.

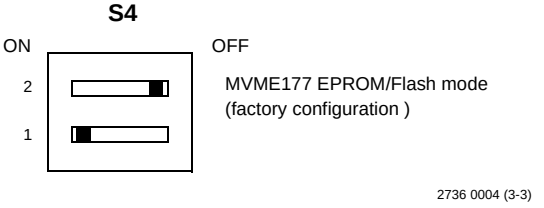
Board EPROM/Flash Mode (S4)

The MVME167P and MVME177P single-board computers share a common board artwork. The two segments of switch S4 jointly define the board EPROM controller model (MVME167 EPROM-only or MVME177 EPROM/Flash) to be emulated when the board initializes.

With S4 segment 1 set to **OFF**, firmware recognizes the board as an MVME167P. Setting S4 segment 1 to **ON** (factory configuration in the MVME177P case) initializes the board in MVME177P mode. Segment 2 selects between Flash-only and EPROM/Flash mode on MVME177P boards. [In the MVME167P case, the position of S4 segment 2 plays no role in configuration.]

On the MVME177P, the EPROMs share 2MB of memory space with the first 2MB of Flash memory. The EPROM can coexist with 2MB of Flash, or you may wish to program all 4MB as Flash memory. The Flash and EPROM configuration is jointly controlled by the setting of S4 and the setting of a control bit (GPIO2) in the VMEchip2 ASIC.

For further details, refer to *Flash Memory* in Chapter 4 and to the *Programmer's Reference Guide* listed under "Related Documentation" in Appendix E.



Preparing the Transition Module

The MVME177P supports the MVME712B transition module, which (in conjunction with an LCP2 adapter board) supplies SCSI and Ethernet connections. It also supports the MVME712M transition module, which (in conjunction with a P2 adapter board) supplies serial and parallel I/O in addition to SCSI and Ethernet connections.

For details on configuring an MVME712B or MVME712M for use with the MVME177P, refer to the transition module documentation listed under "Related Documentation" in Appendix E.

Installation Instructions

This section covers:

- Installation of the MVME177P in a VME chassis
- Installation of the transition module and P2/LCP2 adapter
- System considerations relevant to the installation.

Before proceeding, ensure that EPROM devices are installed as needed. The factory configuration has two EPROMs installed in sockets XU1 and XU2 for the MVME177Bug debug firmware.

MVME177P and Transition Module Installation

With EPROMs installed and jumpers or switches configured as appropriate, proceed as follows to install the MVME177P board in a VME chassis:

1. Turn all equipment power OFF and disconnect the power cable from the AC power source.

Caution

Inserting or removing modules while power is applied could result in damage to module components.

Warning Dangerous voltages, capable of causing death, are present in this equipment. Use extreme caution when handling, testing, and adjusting.

2. Remove the chassis cover as instructed in the user's manual for the equipment.
3. Remove the filler panel from the card slot where you are going to install the MVME177P.
   – If you intend to use the MVME177P as system controller, it must occupy the leftmost card slot (slot 1). The system controller must be in slot 1 to correctly initiate the bus-grant daisy-chain and to ensure proper operation of the IACK daisy-chain driver.
   – If you do not intend to use the MVME177P as system controller, it can occupy any unused double-height card slot.
4. Slide the MVME177P into the selected card slot. Be sure the module is seated properly in the P1 and P2 connectors on the backplane. Do not damage or bend connector pins.
5. Secure the MVME177P in the chassis with the screws provided, making good contact with the transverse mounting rails to minimize RF emissions.
6. Install the MVME712 series transition module in the front or the rear of the VME chassis. (To install an MVME712M, which has a double-wide front panel, you may need to shift other modules in the chassis.)
7. On the chassis backplane, remove the INTERRUPT ACKNOWLEDGE (IACK) and BUS GRANT (BG) jumpers from the header for the card slot occupied by the MVME177P.

Note Some VME backplanes (e.g., those used in Motorola "Modular Chassis" systems) have an autojumpering feature for automatic propagation of the IACK and BG signals. Step 7 does not apply to such backplane designs.

8. Connect the P2 adapter board or LCP2 adapter board and cable(s) to MVME177P backplane connector P2. This provides a connection point for terminals or other peripherals at the EIA-232-D serial ports, parallel port, SCSI port, or LAN Ethernet port. For information on installing the P2 or LCP2 Adapter Board and the MVME712 series transition module(s), refer to the corresponding user's manuals (the *Programmer's Reference Guide* provides some connection diagrams).
9. Connect the appropriate cable(s) to the panel connectors for the serial and parallel ports, SCSI port, and LAN Ethernet port.
   – Note that some cables are not provided with the MVME712 series transition module and must be made or purchased by the user. (Motorola recommends shielded cable for all peripheral connections to minimize radiation.)

Note Some cables are not provided with the MVME712 series module; they must be made or purchased by the user. (Motorola recommends shielded cable for all peripheral connections to minimize radiation.)

10. Connect the peripheral(s) to the cable(s).
11. Install any other required VMEmodules in the system.
12. Replace the chassis cover.
13. Connect the power cable to the AC power source and turn the equipment power ON.

System Considerations

The MVME177P draws power from VMEbus backplane connectors P1 and P2. P2 is also used for the upper 16 bits of data in 32-bit transfers, and for the upper 8 address lines in extended addressing mode. The MVME177P may not operate properly without its main board connected to VMEbus backplane connectors P1 and P2.

Whether the MVME177P operates as a VMEbus master or VMEbus slave, it is configured for 32 bits of address and 32 bits of data (A32/D32). However, it handles A16 or A24 devices in the address ranges indicated in the *VMEchip2* chapter of the *Programmer's Reference Guide*. D8 and/or D16 devices in the system must be handled by the MC68060 software. For specifics, refer to the memory maps in the *Programmer's Reference Guide*.

The MVME177P contains shared onboard DRAM whose base address is software-selectable. Both the onboard processor and offboard VMEbus devices see this local DRAM at base physical address $00000000, as programmed by the MVME177Bug firmware. This may be changed via software to any other base address. Refer to the *MVME1X7P Single Board Computers Programmer's Reference Guide* for more information.

If the MVME177P tries to access offboard resources in a nonexistent location and is not system controller, and if the system does not have a global bus timeout, the MVME177P waits forever for the VMEbus cycle to complete. This will cause the system to lock up. There is only one situation in which the system might lack this global bus timeout: when the MVME177P is not the system controller and there is no global bus timeout elsewhere in the system.

Multiple MVME177Ps may be installed in a single VME chassis. In general, hardware multiprocessor features are supported.

Other MPUs on the VMEbus can interrupt, disable, communicate with, and determine the operational status of the processor(s). One register of the GCSR (global control/status register) set in the VMEchip2 ASIC includes four bits that function as location monitors to allow one MVME177P processor to broadcast a signal to any other MVME177P processors. All eight registers of the GCSR set are accessible from any local processor as well as from the VMEbus.

The MVME177P provides +12Vdc power to the Ethernet LAN transceiver interface through a 1A solid-state fuse (R24) located on the MVME177P module. The **+12V** LED illuminates when +12Vdc is available. If the Ethernet transceiver fails to operate, check the status of R24.

The MVME177P provides SCSI terminator power through a 1A fuse (F1) located on the LCP2 adapter board. The fuse is socketed. If the fuse is blown, the SCSI device(s) may function erratically or not at all.

If a solid-state fuse opens, you will need to remove power for several minutes to let the fuse reset to a closed or shorted condition.

Startup and Operation 2

Introduction

This chapter supplies information on powering up the MVME177P Single-Board Computer after its installation in a system, and describes the functionality of the switches, status indicators, and I/O ports.

For programming information, consult the *MVME1X7P Single Board Computers Programmer's Reference Guide*, listed under "Related Documentation" in Appendix E.

Front Panel Switches and Indicators

There are two switches (**ABORT** and **RESET**) and eight LEDs (**FAIL**, **STAT**, **RUN**, **SCON**, **LAN**, **+12V** [LAN power], **SCSI**, and **VME**) located on the MVME177P front panel.

Table 2-1. MVME177P Front Panel Controls

Control/Indicator	Function
Abort Switch (**ABORT**)	Sends an interrupt signal to the processor. The interrupt is normally used to abort program execution and return control to the debugger firmware located in the MVME177P EPROMs. The interrupter connected to the Abort switch is an edge-sensitive circuit, filtered to remove switch bounce.
Reset Switch (**RESET**)	Resets all onboard devices. Also drives a SYSRESET∗ signal if the MVME177P is system controller. SYSRESET∗ signals may be generated by the Reset switch, a power-up reset, a watchdog timeout, or by a control bit in the Local Control/Status Register (LCSR) in the VMEchip2 ASIC. For further details, refer to Chapter 4, *Functional Description*.
FAIL LED (DS1, red)	Board failure. Lights if a fault occurs on the MVME177P board.
STAT LED (DS2, amber)	CPU status. Lights if the processor enters a halt condition.
RUN LED (DS3, green)	CPU activity. Indicates that one of the local bus masters is executing a local bus cycle.

Table 2-1. MVME177P Front Panel Controls

Control/Indicator	Function
SCON LED (DS4, green)	System controller. Lights when the VMEchip2 ASIC is functioning as VMEbus system controller.
LAN LED (DS5, green)	LAN activity. Lights when the LAN controller is functioning as local bus master.
+12V LED (DS6, green)	Fuse OK. Indicates that +12Vdc power is available to the LAN interface.
SCSI LED (DS7, green)	SCSI activity. Lights when the SCSI controller is functioning as local bus master.
VME LED (DS8, green)	VME activity. Lights when the board is using the VMEbus or being accessed from the VMEbus.

Initial Conditions

After you have verified that all necessary hardware preparation has been done, that all connections have been made correctly, and that the installation is complete, you can power up the system. Applying power to the system (as well as resetting it) triggers an initialization of the MVME177P's MPU, hardware, and firmware along with the rest of the system.

The EPROM- or Flash-resident firmware initializes the devices on the MVME177P board in preparation for booting the operating system. The firmware is shipped from the factory with a set of defaults appropriate to the board. In most cases there is no need to modify the firmware configuration before you boot the operating system. For specifics in this regard, refer to Chapter 3 and to the user documentation for the MVME177Bug firmware.

Applying Power

When you power up (or when you reset) the system, the firmware executes some self-checks and proceeds to the hardware initialization. The system startup flows in a predetermined sequence, following the hierarchy inherent in the processor and the MVME177P hardware. The figure below charts the flow of the basic initialization sequence that takes place during system startup.

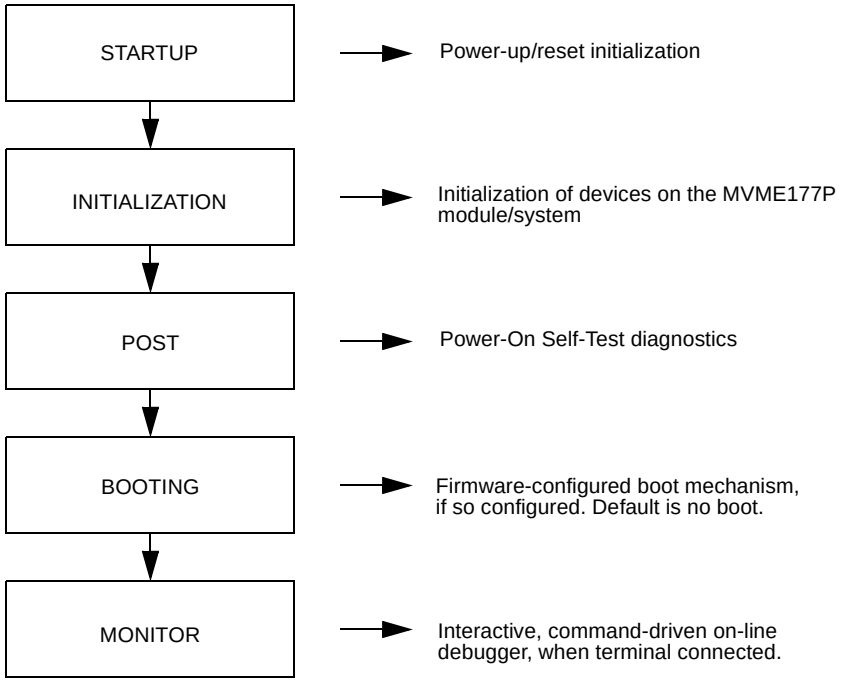


Figure 2-1. MVME177P/Firmware System Startup

2

Pre-Startup Checklist

Before you power up the MVME177P system, be sure that the following conditions exist:

1. Jumpers and/or configuration switches on the MVME177P Single-Board Computer and associated equipment are set as required for your particular application.
2. The MVME177P board is installed and cabled up as appropriate for your particular chassis or system, as outlined in Chapter 1.
3. The terminal that you plan to use as the system console is connected to the console port (serial port 1) on the MVME177P module.
4. The terminal is set up as follows:
   - Eight bits per character
   - One stop bit per character
   - Parity disabled (no parity protection)
   - Baud rate 9600 baud (the default baud rate of many serial ports at power-up)
5. Any other device that you wish to use, such as a host computer system and/or peripheral equipment, is cabled to the appropriate connectors.

After you complete the checks listed above, you are ready to power up the system.

Bringing up the Board

The MVME177P comes with MVME177Bug firmware installed. For the firmware to operate properly with the board, you must follow the steps below.

Caution

Inserting or removing boards with power applied may damage board components.

Turn all equipment power OFF. Refer to *MVME177P Configuration* on page 1-5 and verify that jumpers and switches are configured as necessary for your particular application.

1. Jumper header J1 on the MVME177P contains eight segments, which all affect the operation of the firmware. They are read as a register (at location $FFF40088) in the VMEchip2 Local Control/Status register. (The *MVME1X7P Single Board Computers Programmer's Reference Guide* has additional information.) The bit values are read as a **0** when the jumper is on, or as a **1** when the jumper is off.

   The default configuration has J1 set to all **0**s (all jumpers installed) except GPI3 (pins 7-8). The 177Bug firmware reserves/defines the four lower order bits (GPI0 to GPI3, pins 1-2 to 7-8). Table 2-2 describes the bit assignments on J1.

2. Configure header J6 as appropriate for the desired system controller functionality (always system controller, never system controller, or self-regulating) on the MVME177P.

3. The jumpers on header J9 establish the SRAM backup power source on the MVME177P. The factory configuration uses VMEbus +5V standby voltage as the primary and secondary power source (the onboard battery is disconnected). Verify that this configuration is appropriate for your application.

4. Headers J10 and J11 configure serial port 4 to drive or receive clock signals provided by the RTXC and TRXC signal lines. The MVME177P factory configuration has port 4 set to receive both signals. Refer to the instructions in Chapter 1 if your application requires reconfiguring port 4.

Table 2-2. General-Purpose Configuration Bits (J1)

Bit No.	J1 Segment	Function
GPI0	1-2	When set to 1 (high), instructs the debugger to use local static RAM for its work page (variables, stack, vector tables, etc.).
GPI1	3-4	When set to 1 (high), instructs the debugger to use the default setup/operation parameters in ROM instead of the user setup/operation parameters in NVRAM. The effect is the same as pressing the **RESET** and **ABORT** switches simultaneously. This feature can be helpful in the event the user setup is corrupted or does not meet a sanity check. Refer to the **ENV** command description for the Flash/ROM defaults.
GPI2	5-6	Reserved for future use.
GPI3	7-8	When set to 0 (low), informs the debugger that it is executing out of EPROM. When set to 1 (high), informs the debugger that it is executing from Flash memory.
GPI4	9-10	Open to your application.
GPI5	11-12	Open to your application.
GPI6	13-14	Open to your application.
GPI7	15-16	Open to your application.

5. Verify that the settings of configuration switches S3 (Petra SDRAM size) and S4 (board EPROM/Flash mode) are appropriate for your memory controller emulation.

6. Refer to the setup procedure for your particular chassis or system for details concerning the installation of the MVME177P.

7. Connect the terminal to be used as the 177Bug system console to the default EIA-232-D port at MVME177P Serial Port 1 (Serial Port 2 on the MVME712M transition module). Set the terminal up as follows:

- Eight bits per character
- One stop bit per character
- Parity disabled (no parity)
- Baud rate 9600 baud (the power-up default)

After power-up, you can reconfigure the baud rate of the debug port by using the 177Bug Port Format (**PF**) command.

Note Whatever the baud rate, some form of hardware handshaking — either XON/XOFF or via the RTS/CST line — is desirable if the system supports it. If you get garbled messages and missing characters, you should check the terminal to make sure that handshaking is enabled.

8. If you have other equipment to attach to the MVME712 series transition module, connect the appropriate cables. After power-up, you can reconfigure the port(s) by programming the MVME177P CD2401 Serial Communications Controller (SCC) or by using the 177Bug **PF** command.
9. Power up the system. 177Bug executes some self-checks and displays the debugger prompt `177-Bug>` if the firmware is in Board mode.

   However, if the **ENV** command has placed 177Bug in System mode, the system performs a self-test and tries to autoboot. Refer to the **ENV** and **MENU** commands (Table 3-2).

   If the confidence test fails, the test is aborted when the first fault is encountered. If possible, an appropriate message is displayed, and control then returns to the menu.
10. Before using the MVME177P after the initial installation, set the date and time using the following command line structure:

    `177-Bug>` **SET** [*mmddyyhhmm*]|[<+/-*CAL*>;**C**]

    For example, the following command line starts the real-time clock and sets the date and time to 10:37 a.m., November 7, 2000:

    `177-Bug>` **SET 1107001037**

The board's self-tests and operating systems require that the real-time clock be running.

Autoboot

Autoboot is a software routine included in the 177Bug EPROM to provide an independent mechanism for booting operating systems. The autoboot routine automatically scans for controllers and devices in a specified sequence until a valid bootable device containing a boot media is found or the list is exhausted. If a valid bootable device is found, a boot from that device is started. The controller scanning sequence goes from the lowest controller Logical Unit Number (LUN) detected to the highest LUN detected. Controllers, devices, and their LUNs are listed in Appendix D.

At power-up, Autoboot is enabled and (provided that the drive and controller numbers encountered are valid) the following message is displayed upon the system console:

```
Autoboot in progress... To abort hit <BREAK>
```

A delay follows this message so that you can abort the Autoboot process if you wish. Then the actual I/O begins: the program designated within the volume ID of the media specified is loaded into RAM and control passes to it. If you want to gain control without Autoboot during this time, however, you can press the <BREAK> key or use the **ABORT** or **RESET** switches on the front panel.

The Autoboot process is controlled by parameters contained in the **ENV** command. These parameters allow the selection of specific boot devices and files, and allow programming of the Boot delay. Refer to the **ENV** command description in Chapter 3 for more details.

Caution

Although you can use streaming tape to autoboot, the same power supply must be connected to the tape drive, the controller, and the MVME177P. At power-up, the tape controller will position the streaming tape to the load point where the volume ID can correctly be read and used.

However, if the MVME177P loses power but the controller does not, and the tape happens to be at load point, the necessary command sequences (Attach and Rewind) cannot be given to the controller and the autoboot will not succeed.

ROMboot

As shipped from the factory, 177Bug occupies the first quarter of the EPROM in sockets XU1 and XU2. This leaves the remainder of XU1 and XU2 storage and Flash memory (depending on the setting of S4) available for your use.

Note You may wish to contact your Motorola sales office for assistance in using these resources.

The ROMboot function is configured/enabled via the **ENV** command (refer to Chapter 3) and is executed at power-up (optionally also at reset).

You can also execute the ROMboot function via the **RB** command, assuming there is valid code in the memory devices (or optionally elsewhere on the board or VMEbus) to support it. If ROMboot code is installed, a user-written routine is given control (if the routine meets the format requirements).

One use of ROMboot might be resetting the SYSFAIL∗ line on an unintelligent controller module. The **NORB** command disables the function.

For a user's ROMboot module to gain control through the ROMboot linkage, four conditions must exist:

- Power has just been applied (but the **ENV** command can change this to also respond to any reset).
- Your routine is located within the MVME177P EPROM memory map (but the **ENV** command can change this to any other portion of the onboard memory, or even offboard VMEbus memory).
- The ASCII string "BOOT" is found in the specified memory range.

- Your routine passes a checksum test, which ensures that this routine was really intended to receive control at powerup.

For complete details on using the ROMboot function, refer to the *Debugging Package for Motorola 68K CISC CPUs User's Manual.*

Network Boot

Network Auto Boot is a software routine in the 177Bug EPROM which provides a mechanism for booting an operating system using a network (local Ethernet interface) as the boot device. The Network Auto Boot routine automatically scans for controllers and devices in a specified sequence until a valid bootable device containing boot media is found or until the list is exhausted. If a valid bootable device is found, a boot from that device is started. The controller scanning sequence goes from the lowest controller Logical Unit Number (LUN) detected to the highest LUN detected. (Refer to Appendix C for default LUNs.)

At power-up, Network Boot is enabled and (provided that the drive and controller numbers encountered are valid) the following message is displayed upon the system console:

```
Network Boot in progress... To abort hit <BREAK>
```

After this message, there is a delay to let you abort the Auto Boot process if you wish. Then the actual I/O is begun: the program designated within the volume ID of the media specified is loaded into RAM and control passes to it. If you want to gain control without Network Boot during this time, however, you can press the <BREAK> key or use the software **ABORT** or **RESET** switches.

Network Auto Boot is controlled by parameters contained in the **NIOT** and **ENV** commands. These parameters allow the selection of specific boot devices, systems, and files, and allow programming of the Boot delay. Refer to the **ENV** command description in Chapter 3 for more details.

Restarting the System

You can initialize the system to a known state in three different ways: Reset, Abort, and Break. Each method has characteristics which make it more suitable than the others in certain situations.

A special debugger function is accessible during resets. This feature instructs the debugger to use the default setup/operation parameters in ROM instead of your own setup/operation parameters in NVRAM. To activate this function, you press the **RESET** and **ABORT** switches at the same time. This feature can be helpful in the event that your setup/operation parameters are corrupted or do not meet a sanity check. Refer to the **ENV** command description in Chapter 3 for the ROM defaults.

Reset

Powering up the MVME177P initiates a system reset. You can also initiate a reset by pressing and quickly releasing the **RESET** switch on the MVME177P front panel, or reset the board in software.

For details on resetting the MVME177P board through software, refer to the *MVME1X7P Single Board Computers Programmer's Reference Guide*, listed under "Related Documentation" in Appendix E.

Both "cold" and "warm" reset modes are available. By default, 177Bug is in "cold" mode. During *cold* resets, a total system initialization takes place, as if the MVME177P had just been powered up. All static variables (including disk device and controller parameters) are restored to their default states. The breakpoint table and offset registers are cleared. The target registers are invalidated. Input and output character queues are cleared. Onboard devices (timer, serial ports, etc.) are reset, and the two serial ports are reconfigured to their default state.

During *warm* resets, the 177Bug variables and tables are preserved, as well as the target state registers and breakpoints.

Note that when the MVME177P comes up in a cold reset, 177Bug runs in Board mode. Using the Environment (**ENV**) or **MENU** commands can make 177Bug run in System mode. Refer to Chapter 3 for specifics.

You will need to reset your system if the processor ever halts, or if the 177Bug environment is ever lost (vector table is destroyed, stack corrupted, etc.).

Abort

Aborts are invoked by pressing and releasing the **ABORT** switch on the MVME177P front panel. When you invoke an abort while executing a user program (running target code), a snapshot of the processor state is stored in the target registers. This characteristic makes aborts most appropriate for terminating user programs that are being debugged.

If a program gets caught in a loop, for instance, aborts should be used to regain control. The target PC, register contents, etc., help to pinpoint the malfunction.

Pressing and releasing the **ABORT** switch generates a local board condition which may interrupt the processor if enabled. The target registers, reflecting the machine state at the time the **ABORT** switch was pressed, are displayed on the screen. Any breakpoints installed in your code are removed and the breakpoint table remains intact. Control returns to the debugger.

Break

Pressing and releasing the <BREAK> key on the terminal keyboard generates a ‘‘power break’’. Breaks do not produce interrupts. The only time that breaks are recognized is while characters are being sent or received by the console port. A break removes any breakpoints in your code and keeps the breakpoint table intact. If the function was entered using SYSCALL, Break also takes a snapshot of the machine state. This machine state is then accessible to you for diagnostic purposes.

In many cases, you may wish to terminate a debugger command before its completion (for example, during the display of a large block of memory). Break allows you to terminate the command.

Diagnostic Facilities

The 177Bug package includes a set of hardware diagnostics for testing and troubleshooting the MVME177P. To use the diagnostics, switch directories to the diagnostic directory.

If you are in the debugger directory, you can switch to the diagnostic directory with the debugger command Switch Directories (**SD**). The diagnostic prompt `177-Diag>` appears. Refer to the *Debugging Package for Motorola 68K CISC CPUs User's Manual* for complete descriptions of the diagnostic routines available and instructions on how to invoke them. Note that some diagnostics depend on restart defaults that are set up only in a particular restart mode. The documentation for such diagnostics includes restart information.

177Bug Firmware 3

Introduction

The 177Bug firmware is the layer of software just above the hardware. The firmware supplies the appropriate initialization for devices on the MVME177P board upon power-up or reset.

This chapter describes the basics of 177Bug and its architecture, describes the monitor (interactive command portion of the firmware) in detail, and gives information on using the debugger and special commands. A list of 177Bug commands appears at the end of the chapter.

For complete user information about 177Bug, refer to the *Debugging Package for Motorola 68K CISC CPUs User's Manual* and to the *MVME177Bug Diagnostics User's Manual*, listed under *Related Documentation*.

177Bug Overview

The firmware for the M68000-based (68K) series of board and system level products has a common genealogy, deriving from the Bug firmware currently used on all Motorola M68000-based CPUs. The M68000 firmware version implemented on the MVME177P MC68060-based embedded controller is known as MVME177Bug, or 177Bug. It includes diagnostics for testing and configuring IndustryPack modules.

177Bug is a powerful evaluation and debugging tool for systems built around MVME177P CISC-based microcomputers. Facilities are available for loading and executing user programs under complete operator control for system evaluation. The 177Bug firmware provides a high degree of functionality, user friendliness, portability, and ease of maintenance.

177Bug includes:

- Commands for display and modification of memory
- Breakpoint and tracing capabilities
- A powerful assembler/disassembler useful for patching programs
- A "self-test at power-up" feature which verifies the integrity of the system

In addition, the TRAP #15 system calls make various 177Bug routines that handle I/O, data conversion, and string functions available to user programs.

177Bug consists of three parts:

- A command-driven user-interactive *software debugger*, described in this chapter. It is referred to here as "the debugger" or "177Bug".
- A command-driven *diagnostic package* for the MVME177P hardware, referred to here as "the diagnostics".
- A *user interface* or *debug/diagnostics monitor* that accepts commands from the system console terminal.

When using 177Bug, you operate out of either the *debugger directory* or the *diagnostic directory*.

- If you are in the debugger directory, the debugger prompt `177-Bug>` is displayed and you have all of the debugger commands at your disposal.
- If you are in the diagnostic directory, the diagnostic prompt `177-Diag>` is displayed and you have all of the diagnostic commands at your disposal as well as all of the debugger commands.

Because 177Bug is command-driven, it performs its various operations in response to user commands entered at the keyboard. When you enter a command, 177Bug executes the command and the prompt reappears. However, if you enter a command that causes execution of user target code (for example, **GO**), then control may or may not return to 177Bug, depending on the outcome of the user program.

If you have used one or more of Motorola's other debugging packages, you will find the CISC 177Bug very similar. Some effort has also been made to improve the consistency of interactive commands. For example, delimiters between commands and arguments may be commas or spaces interchangeably.

177Bug Implementation

Physically, 177Bug is contained in two 27D4002 44-pin EPROMs installed in sockets XU1 and XU2. The executable code is checksummed at every power-on or reset firmware entry, and the result (which includes a precalculated checksum contained in the memory devices) is tested for an expected zero. Users are cautioned against modification of the memory devices unless precautions for re-checksumming are taken.

Memory Requirements

The program portion of 177Bug is approximately 512KB of code, consisting of download, debugger, and diagnostic packages contained entirely in EPROM.

The 177Bug firmware executes from address $FF800000 in EPROM. The 177Bug initial stack completely changes 8KB of SRAM memory at addresses $FFE0C000 through $FFE0DFFF, at power-up or reset.

Table 3-1. Memory Offsets with 177Bug

Type of Memory Present	Default DRAM Base Address	Default SRAM Base Address
4/8/16/32/64MB/128MB shared DRAM (SDRAM) with ECC protection	$00000000	$FFE00000 (onboard SRAM)

The 177Bug firmware requires 2KB of NVRAM for storage of board configuration, communication, and booting parameters. This storage area begins at $FFFC16F8 and ends at $FFFC1EF7.

177Bug requires a minimum of 64KB of contiguous read/write memory to operate. The **ENV** command controls where this block of memory is located. Regardless of where the onboard RAM is located, the first 64KB is used for 177Bug stack and static variable space and the rest is reserved as user space. Whenever the MVME177P is reset, the target PC is initialized to the address corresponding to the beginning of the user space, and the target stack pointers are initialized to addresses within the user space, with the target Interrupt Stack Pointer (ISP) set to the top of the user space.

Using 177Bug

177Bug is command-driven; it performs its various operations in response to commands that you enter at the keyboard. When the `177-Bug>` prompt appears on the terminal screen, the debugger is ready to accept debugger commands. When the `177-Diag>` prompt appears on the screen, the debugger is ready to accept diagnostics commands.

To switch from one mode to the other, enter **SD** (Switch Directories). To examine the commands in the directory that you are currently in, use the Help command (**HE**).

What you key in is stored in an internal buffer. Execution begins only after the carriage return is entered. This allows you to correct entry errors, if necessary, with the control characters described in the *Debugging Package for Motorola 68K CISC CPUs User's Manual*, Chapter 1.

After the debugger executes the command you have entered, the prompt reappears. However, if the command causes execution of user target code (for example **GO**), then control may or may not return to the debugger, depending on what the user program does.

For example, if a breakpoint has been specified, then control returns to the debugger when the breakpoint is encountered during execution of the user program. Alternatively, the user program could return to the debugger by means of the System Call Handler routine RETURN (described in the *Debugging Package for Motorola 68K CISC CPUs User's Manual*, Chapter 5).

A debugger command is made up of the following parts:

- The command name, either uppercase or lowercase (e.g., **MD** or **md**).
- A port number (if the command is set up to work with more than one port).
- Any required arguments, as specified by the command.
- At least one space before the first argument. Precede all other arguments with either a space or comma.
- One or more options. Precede an option or a string of options with a semicolon (**;**). If no option is entered, the command's default option conditions are used.

Debugger Commands

The 177Bug debugger commands are summarized in the following table. The commands are described in detail in the *Debugging Package for Motorola 68K CISC CPUs User's Manual*.

Table 3-2. Debugger Commands

Command	Description
AB	Automatic Bootstrap Operating System
NOAB	No Autoboot
AS	One Line Assembler
BC	Block of Memory Compare
BF	Block of Memory Fill
BH	Bootstrap Operating System and Halt
BI	Block of Memory Initialize
BM	Block of Memory Move
BO	Bootstrap Operating System
BR	Breakpoint Insert
NOBR	Breakpoint Delete
BS	Block of Memory Search
BV	Block of Memory Verify

Table 3-2. Debugger Commands (Continued)

Command	Description
CM	Concurrent Mode
NOCM	No Concurrent Mode
CNFG	Configure Board Information Block
CS	Checksum
DC	Data Conversion
DMA	DMA Block of Memory Move
DS	One Line Disassembler
DU	Dump S-records
ECHO	Echo String
ENV	Set Environment to Bug/Operating System
GD	Go Direct (Ignore Breakpoints)
GN	Go to Next Instruction
GO	Go Execute User Program
GT	Go to Temporary Breakpoint
HE	Help
IOC	I/O Control for Disk
IOI	I/O Inquiry
IOP	I/O Physical (Direct Disk Access)
IOT	I/O "Teach" for Configuring Disk Controller
IRQM	Interrupt Request Mask
LO	Load S-records from Host
MA	Macro Define/Display
NOMA	Macro Delete
MAE	Macro Edit
MAL	Enable Macro Expansion Listing
NOMAL	Disable Macro Expansion Listing
MAW	Save Macros
MAR	Load Macros
MD	Memory Display
MENU	Menu
MM	Memory Modify
MMD	Memory Map Diagnostic
MS	Memory Set

Table 3-2. Debugger Commands (Continued)

Command	Description
MW	Memory Write
NAB	Automatic Network Boot Operating System
NBH	Network Boot Operating System and Halt
NBO	Network Boot Operating System
NIOC	Network I/O Control
NIOP	Network I/O Physical
NIOT	Network I/O Teach
NPING	Network Ping
OF	Offset Registers Display/Modify
PA	Printer Attach
NOPA	Printer Detach
PF	Port Format
NOPF	Port Detach
PS	Put RTC Into Power Save Mode for Storage
RB	ROMboot Enable
NORB	ROMboot Disable
RD	Register Display
REMOTE	Connect the Remote Modem to CSO
RESET	Cold/Warm Reset
RL	Read Loop
RM	Register Modify
RS	Register Set
SD	Switch Directories
SET	Set Time and Date
SYM	Symbol Table Attach
NOSYM	Symbol Table Detach
SYMS	Symbol Table Display/Search
T	Trace
TA	Terminal Attach
TC	Trace on Change of Control Flow
TIME	Display Time and Date
TM	Transparent Mode
TT	Trace to Temporary Breakpoint

Table 3-2. Debugger Commands (Continued)

Command	Description
VE	Verify S-Records Against Memory
VER	Display Revision/Version
WL	Write Loop

Modifying the Environment

You can use the factory-installed debug monitor, 177Bug, to modify certain parameters contained in the MVME177P's Non-Volatile RAM (NVRAM), also known as Battery Backed-Up RAM (BBRAM).

- The Board Information Block in NVRAM contains various entries that define operating parameters of the board hardware. Use the 177Bug command **CNFG** to change those parameters.
- Use the 177Bug command **ENV** to change configurable 177Bug parameters in NVRAM.

The **CNFG** and **ENV** commands are both described in the *Debugging Package for Motorola 68K CISC CPUs User's Manual.* Refer to that manual for general information about their use and capabilities.

The following paragraphs present supplementary information on **CNFG** and **ENV** that is specific to the 177Bug firmware, along with the parameters that you can modify with the **ENV** command.

CNFG - Configure Board Information Block

Use this command to display and configure the Board Information Block which resides within the NVRAM. The board information block contains various elements that correspond to specific operational parameters of the MVME177P board.

The board structure for the MVME177P is as follows:

```
177-Bug>cnfg
Board (PWA) Serial Number = "     "
Board Identifier = "     "
```

```
Artwork (PWA) Identifier = "     "
MPU Clock Speed = "     "
Ethernet Address = 0001AF00000
Local SCSI Identifier = "     "
Optional Board 1 Artwork (PWA) Identifier = "     "
Optional Board 1 (PWA) Serial Number = "     "
Optional Board 2 Artwork (PWA) Identifier = "     "
Optional Board 2 (PWA) Serial Number = "     "
177-Bug>
```

The parameters that are quoted are left-justified character (ASCII) strings padded with space characters, and the quotes (") are displayed to indicate the size of the string. Parameters that are not quoted are considered data strings, and data strings are right-justified. The data strings are padded with zeros if the length is not met.

The Board Information Block is factory-configured before shipment. There is no need to modify block parameters unless the NVRAM is corrupted.

Refer to the *MVME1X7P Single Board Computers Programmer's Reference Guide* for the actual location and other information about the Board Information Block. Refer to the *Debugging Package for Motorola 68K CISC CPUs User's Manual* for a **CNFG** description and examples.

ENV - Set Environment

Use the **ENV** command to view and/or configure interactively all 177Bug operational parameters that are kept in Non-Volatile RAM (NVRAM).

Refer to the *Debugging Package for Motorola 68K CISC CPUs User's Manual* for a description of the use of **ENV**. Additional information on registers in the MVME177P that affect these parameters appears in your *MVME1X7P Single Board Computers Programmer's Reference Guide.*

Listed and described below are the parameters that you can configure using **ENV**. The default values shown are those that were in effect when this document was published.

Note In the event of difficulty with the MVME177P, you may wish to use **env;d** <CR> to restore the factory defaults as a troubleshooting aid (see Appendix B).

Configuring the 177Bug Parameters

The parameters that can be configured using **ENV** are:

Table 3-3. ENV Command Parameters

ENV Parameter and Options	Default	Meaning of Default
Bug or System environment [B/S]	B	Bug mode
Field Service Menu Enable [Y/N]	N	Do not display field service menu.
Remote Start Method Switch [G/M/B/N]	B	Use both methods [Global Control and Status Register (GCSR) in the VMEchip2, and Multiprocessor Control Register (MPCR) in shared RAM] to pass and execute cross-loaded programs.
Probe System for Supported I/O Controllers [Y/N]	Y	Accesses will be made to the appropriate system buses (e.g., VMEbus, local MPU bus) to determine presence of supported controllers.
Negate VMEbus SYSFAIL* Always [Y/N]	N	Negate VMEbus SYSFAIL* after successful completion or entrance into the bug command monitor.

Table 3-3. ENV Command Parameters (Continued)

ENV Parameter and Options	Default	Meaning of Default
Local SCSI Bus Reset on Debugger Startup [Y/N]	N	No local SCSI bus reset on debugger startup.
Local SCSI Bus Negotiations Type [A/S/N]	A	Asynchronous negotiations.
Ignore CFGA Block on a Hard Disk Boot [Y/N]	Y	Configuration Area (CFGA) Block contents are disregarded at boot (hard disk only).
Auto Boot Enable [Y/N]	N	Auto Boot function is disabled.
Auto Boot at power-up only [Y/N]	Y	Auto Boot is attempted at power-up reset only.
Auto Boot Controller LUN	00	Specifies LUN of disk/tape controller module currently supported by the Bug. Default is $0.
Auto Boot Device LUN	00	Specifies LUN of disk/tape device currently supported by the Bug. Default is $0.
Auto Boot Abort Delay	15	The time in seconds that the Auto Boot sequence will delay before starting the boot. The delay gives you the option of stopping the boot by use of the Break key. The time span is 0-255 seconds.
Auto Boot Default String [Y(NULL String)/(String)]		You may specify a string (filename) to pass on to the code being booted. Maximum length is 16 characters. Default is the null string.
ROM Boot Enable [Y/N]	N	ROMboot function is disabled.
ROM Boot at power-up only [Y/N]	Y	ROMboot is attempted at power-up only.
ROM Boot Enable search of VMEbus [Y/N]	N	VMEbus address space will not be accessed by ROMboot.
ROM Boot Abort Delay	00	The time in seconds that the ROMboot sequence will delay before starting the boot. The delay gives you the option of stopping the boot by use of the Break key. The time span is 0-255 seconds.
ROM Boot Direct Starting Address	FF800000	First location tested when the Bug searches for a ROMboot module.
ROM Boot Direct Ending Address	FFDFFFFC	Last location tested when the Bug searches for a ROMboot module.
Network Auto Boot Enable [Y/N]	N	Network Auto Boot function is disabled.

Table 3-3. ENV Command Parameters (Continued)

ENV Parameter and Options	Default	Meaning of Default
Network Auto Boot at power-up only [Y/N]	Y	Network Auto Boot is attempted at power-up reset only.
Network Auto Boot Controller LUN	00	Specifies LUN of a disk/tape controller module currently supported by the Bug. Default is $0.
Network Auto Boot Device LUN	00	Specifies LUN of a disk/tape device currently supported by the Bug. Default is $0.
Network Auto Boot Abort Delay	5	The time in seconds that the Network Boot sequence will delay before starting the boot. The delay gives you the option of stopping the boot by use of the Break key. The time span is 0-255 seconds.
Network Autoboot Configuration Parameters Pointer (NVRAM)	00000000	The address where the network interface configuration parameters are to be saved in NVRAM; these are the parameters necessary to perform an unattended network boot.
Memory Search Starting Address	00000000	Where the Bug begins to search for a work page (a 64KB block of memory) to use for vector table, stack, and variables. This must be a multiple of the debugger work page, modulo $10000 (64KB). In a multi-controller environment, each MVME177P board could be set to start its work page at a unique address to allow multiple debuggers to operate simultaneously.
Memory Search Ending Address	00100000	Top limit of the Bug's search for a work page. If no 64KB contiguous block of memory is found in the range specified by Memory Search Starting Address and Memory Search Ending Address parameters, the bug will place its work page in the onboard static RAM on the MVME177P. Default Memory Search Ending Address is the calculated size of local memory.

Table 3-3. ENV Command Parameters (Continued)

ENV Parameter and Options	Default	Meaning of Default
Memory Search Increment Size	00010000	Multi-CPU feature used to offset the location of the Bug work page. This must be a multiple of the debugger work page, modulo $10000 (64KB). Typically, Memory Search Increment Size is the product of CPU number and size of the Bug work page. Example: first CPU $0 (0 x $10000), second CPU $10000 (1 x $10000), etc.
Memory Search Delay Enable [Y/N]	N	No delay before the Bug begins its search for a work page.
Memory Search Delay Address	FFFFD20F	Default address is $FFFFD20F. This is the MVME177P GCSR GPCSR0 as accessed through VMEbus A16 space; it assumes the MVME177P GRPAD (group address) and BDAD (board address within group) switches are set to "on". This byte-wide value is initialized to $FF by MVME177P hardware after a System or Power-On reset. In a multi-177P environment, where the work pages of several Bugs reside in the memory of the primary (first) MVME177P, the non-primary CPUs will wait for the data at the Memory Search Delay Address to be set to $00, $01, or $02 (refer to the *Memory Requirements* section in Chapter 3 for the definition of these values) before attempting to locate their work page in the memory of the primary CPU.
Memory Size Enable [Y/N]	Y	Memory is sized for Self-Test diagnostics.
Memory Size Starting Address	00000000	Default Starting Address is $0.
Memory Size Ending Address	00100000	Default Ending Address is the calculated size of local memory.

Table 3-3. ENV Command Parameters (Continued)

ENV Parameter and Options	Default	Meaning of Default
Note Memory Configuration Defaults. The default configuration for Dynamic RAM mezzanine boards will position the mezzanine with the largest memory size to start at the address selected with the **ENV** parameter "Base Address of Dynamic Memory". The Base Address parameter defaults to 0. The smaller sized mezzanine will follow immediately above the larger in the memory map. If mezzanines of the same size and type are present, the first (closest to the board) is mapped to the selected base address. If mezzanines of the same size but different type (parity and ECC) are present, the parity type will be mapped to the selected base address and the ECC type mezzanine will follow. The SRAM does not default to a location in the memory map that is contiguous with Dynamic RAM.		
Base Address of Local Memory	00000000	Beginning address of Local Memory (ECC type memory on the MVME177P). Must be a multiple of the Local Memory board size, starting with 0. Default is $0.
Size of Local Memory Board 0	00000000	You are prompted twice, once for each possible MVME177P memory board. The default is the calculated size of the memory board.
Size of Local Memory Board 1	00000000	
ENV asks the following series of questions to set up the VMEbus interface for the MVME177P modules. You should have a working knowledge of the VMEchip2 as given in the *MVME1X7P Single Board Computers Programmer's Reference Guide* in order to perform this configuration. The slave address decoders are used to allow another VMEbus master to access a local resource of the MVME177P. There are two slave address decoders set. They are set up as follows:		
Slave Enable #1 [Y/N]	Y	Yes, set up and enable Slave Address Decoder #1.
Slave Starting Address #1	00000000	Base address of the local resource that is accessible by the VMEbus. Default is the base of local memory, $0.
Slave Ending Address #1	000FFFFF	Ending address of the local resource that is accessible by the VMEbus. Default is the end of calculated memory.

Table 3-3. ENV Command Parameters (Continued)

ENV Parameter and Options	Default	Meaning of Default
Slave Address Translation Address #1	00000000	This register allows the VMEbus address and the local address to differ. The value in this register is the base address of the local resource that is associated with the starting and ending address selection from the previous questions. Default is 0.
Slave Address Translation Select #1	00000000	This register defines which bits of the address are significant. A logical "1" indicates significant address bits, logical "0" is non-significant. Default is 0.
Slave Control #1	03FF	Defines the access restriction for the address space defined with this slave address decoder. Default is $03FF.
Slave Enable #2 [Y/N]	N	Do not set up and enable Slave Address Decoder #2.
Slave Starting Address #2	00000000	Base address of the local resource that is accessible by the VMEbus. Default is 0.
Slave Ending Address #2	00000000	Ending address of the local resource that is accessible by the VMEbus. Default is 0.
Slave Address Translation Address #2	00000000	Works the same as Slave Address Translation Address #1. Default is 0.
Slave Address Translation Select #2	00000000	Works the same as Slave Address Translation Select #1. Default is 0.
Slave Control #2	0000	Defines the access restriction for the address space defined with this slave address decoder. Default is $0000.
Master Enable #1 [Y/N]	Y	Yes, set up and enable Master Address Decoder #1.
Master Starting Address #1	02000000	Base address of the VMEbus resource that is accessible from the local bus. Default is the end of calculated local memory (unless memory is less than 16MB; then this register is always set to 01000000).
Master Ending Address #1	EFFFFFFF	Ending address of the VMEbus resource that is accessible from the local bus. Default is the end of calculated memory.

Table 3-3. ENV Command Parameters (Continued)

ENV Parameter and Options	Default	Meaning of Default
Master Control #1	0D	Defines the access characteristics for the address space defined with this master address decoder. Default is $0D.
Master Enable #2 [Y/N]	N	Do not set up and enable Master Address Decoder #2.
Master Starting Address #2	00000000	Base address of the VMEbus resource that is accessible from the local bus. Default is $00000000.
Master Ending Address #2	00000000	Ending address of the VMEbus resource that is accessible from the local bus. Default is $00000000.
Master Control #2	00	Defines the access characteristics for the address space defined with this master address decoder. Default is $00.
Master Enable #3 [Y/N]	Depends on calculated size of local RAM	Yes, set up and enable Master Address Decoder #3. This is the default if the board contains less than 16MB of calculated RAM. Do not set up and enable the Master Address Decoder #3. This is the default for boards containing at least 16MB of calculated RAM.
Master Starting Address #3	00000000	Base address of the VMEbus resource that is accessible from the local bus. If enabled, the value is calculated as one more than the calculated size of memory. If not enabled, the default is $00000000.
Master Ending Address #3	00000000	Ending address of the VMEbus resource that is accessible from the local bus. If enabled, the default is $00FFFFFF, otherwise $00000000.
Master Control #3	00	Defines the access characteristics for the address space defined with this master address decoder. If enabled, the default is $3D, otherwise $00.
Master Enable #4 [Y/N]	N	Do not set up and enable Master Address Decoder #4.
Master Starting Address #4	00000000	Base address of the VMEbus resource that is accessible from the local bus. Default is $0.

Table 3-3. ENV Command Parameters (Continued)

ENV Parameter and Options	Default	Meaning of Default
Master Ending Address #4	00000000	Ending address of the VMEbus resource that is accessible from the local bus. Default is $0.
Master Address Translation Address #4	00000000	This register allows the VMEbus address and the local address to differ. The value in this register is the base address of the VMEbus resource that is associated with the starting and ending address selection from the previous questions. Default is 0.
Master Address Translation Select #4	00000000	This register defines which bits of the address are significant. A logical "1" indicates significant address bits, logical "0" is non-significant. Default is 0.
Master Control #4	00	Defines the access characteristics for the address space defined with this master address decoder. Default is $00.
Short I/O (VMEbus A16) Enable [Y/N]	Y	Yes, Enable the Short I/O Address Decoder.
Short I/O (VMEbus A16) Control	01	Defines the access characteristics for the address space defined with the Short I/O address decoder. Default is $01.
F-Page (VMEbus A24) Enable [Y/N]	Y	Yes, Enable the F-Page Address Decoder.
F-Page (VMEbus A24) Control	02	Defines the access characteristics for the address space defined with the F-Page address decoder. Default is $02.
ROM Speed Bank A Code	04	Defines the ROM access time. The default is $04, which sets an access time of five clock cycles of the local bus.
ROM Speed Bank B Code	04	
Static RAM Speed Code	02	Defines the SRAM access time. Default is $02.
PCC2 Vector Base VMEC2 Vector Base #1 VMEC2 Vector Base #2	05 06 07	Base interrupt vector for the component specified. Default: PCCchip2 = $05, VMEchip2 Vector 1 = $06, VMEchip2 Vector 2 = $07.
VMEC2 GCSR Group Base Address	D2	Specifies group address ($FFFF*XX*00) in Short I/O for this board. Default = $D2.

Table 3-3. ENV Command Parameters (Continued)

ENV Parameter and Options	Default	Meaning of Default
VMEC2 GCSR Board Base Address	00	Specifies base address ($FFFFD2*XX*) in Short I/O for this board. Default = $00.
VMEbus Global Time Out Code	01	Controls VMEbus timeout when the MVME177P is system controller. Default $01 = 64 µs.
Local Bus Time Out Code	02	Controls local bus timeout. Default $02 = 256 µs.
VMEbus Access Time Out Code	02	Controls the local-bus-to-VMEbus access timeout. Default $02 = 32 ms.

Functional Description 4

Introduction

This chapter describes the MVME177P Single-Board Computer on a block diagram level. The *Summary of Features* provides an overview of the MVME177P, followed by a detailed description of several blocks of circuitry. Figure 4-1 shows a block diagram of the overall board architecture.

Detailed descriptions of other MVME177P blocks, including programmable registers in the ASICs and peripheral chips, can be found in the *Programmer's Reference Guide* (part number V1x7PA/PG). Refer to that manual for a functional description of the MVME177P in greater depth.

Summary of Features

The following table summarizes the features of the MVME177P Single-Board Computer..

Table 4-1. MVME177P Features

Feature	Description
Microprocessor	50MHz or 60MHz MC68060 processor
Form factor	6U VMEbus
Memory	16/32/64/128MB synchronous DRAM (SDRAM), configurable to emulate 4/8/16/32/64/128MB ECC-protected DRAM
	128KB SRAM with battery backup
EPROM	Two 44-pin JEDEC standard PLCC EPROM sockets with 256Kb x 16 density
Flash	Four Intel 28F008SA Flash memory devices with optional write protection
Real-time clock	8KB NVRAM with RTC, battery backup, and watchdog function (SGS-Thomson M48T58)

Table 4-1. MVME177P Features (Continued)

Feature	Description
Switches	**RESET** and **ABORT** switches on front panel
Status LEDs	Eight: Board Fail (**FAIL**), CPU Status (**STAT**), CPU Activity (**RUN**), System Controller (**SCON**), LAN Activity (**LAN**), LAN Power (**+12V**), SCSI Activity (**SCSI**), VME Activity (**VME**)
Timers	Four 32-bit tick timers and watchdog timer in Petra ASIC
	Two 32-bit tick timers and watchdog timer in VMEchip2 ASIC
Interrupts	Eight software interrupts (including those in the VMEchip2 ASIC)
VME I/O	VMEbus P2 connector
Serial I/O	Four EIA-232-D DTE configurable serial ports via VMEbus P2 connector and transition module
Parallel I/O	Centronics-compatible bidirectional parallel port via VMEbus P2 connector and transition module
Ethernet I/O	Ethernet transceiver interface via DB15 connector on transition module
SCSI I/O	SCSI interface with DMA via LCP2 adapter board
VMEbus interface	VMEbus system controller functions
	VMEbus-to-local-bus interface (A24/A32, D8/D16/D32/block transfer [D8/D16/D32/D64])
	Local-bus-to-VMEbus interface (A16/A24/A32, D8/D16/D32)
	VMEbus interrupter
	VMEbus interrupt handler
	Global Control/Status Register (GCSR) for interprocessor communications
	DMA for fast local memory/VMEbus transfers (A16/A24/A32, D16/D32/D64)

Processor and Memory

The MVME177P is based on the MC68060 microprocessor. The boards are built with 16MB, 32MB, 64MB, or 128MB synchronous DRAM (SDRAM). Various versions of the MVME177P may have the SDRAM configured to model 4MB, 8MB, 16MB, 32MB, 64MB, or 128MB of ECC-protected DRAM.

All boards are available with 128KB of SRAM (with battery backup); time-of-day clock (with battery backup); an Ethernet transceiver interface; four serial ports with EIA-232-D DTE interface; bidirectional parallel port; four tick timers with watchdog timer(s); two EPROM sockets; Flash memory; SCSI bus interface with DMA; and a VMEbus interface (local bus to VMEbus/VMEbus to local bus, with A16/A24/A32, D8/D16/D32 bus widths and a VMEbus system controller).

I/O Implementation

Input/Output (I/O) signals on the MVME177P are routed to the VMEbus P2 connector. The main board is connected through a P2/LCP2 adapter board and cables to the transition board. The MVME177P supports the MVME712B and MVME712M transition boards. It also accommodates older MVME712 series transition modules, which provide configuration headers, serial port drivers, and industry-standard connectors for various I/O devices.

ASICs

The following ASICs are used on the MVME177P:

- **VMEchip2 ASIC** (VMEbus interface). Provides two tick timers, a watchdog timer, programmable map decoders for the master and slave interfaces, and a VMEbus to/from local bus DMA controller as well as a VMEbus to/from local bus non-DMA programmed access interface, a VMEbus interrupter, a VMEbus system controller, a VMEbus interrupt handler, and a VMEbus requester.

  Processor-to-VMEbus transfers are D8, D16, or D32. VMEchip2 DMA transfers to the VMEbus, however, are D16, D32, D16/BLT, D32/BLT, or D64/MBLT.

- **Petra ASIC**. Supplants the MCECC chip used on previous versions of the MVME177; provides an ECC DRAM emulation.

- **PCCchip2 ASIC**. Provides an eight-bit bidirectional parallel port.

Block Diagram

The block diagram in Figure 4-1 on page 4-5 illustrates the MVME177P's overall architecture.

4

Functional Description

This section contains a functional description of the major blocks on the MVME177P.

Data Bus Structure

The local data bus on the MVME177P is a 32-bit synchronous bus that is based on the MC68060 bus, and which supports burst transfers and snooping. The various local bus master and slave devices use the local bus to communicate. The local bus is arbitrated by priority type; the priority of the local bus masters from highest to lowest is: 82596CA LAN, CD2401 serial (through the PCCchip2), 53C710 SCSI, VMEbus, and MPU. In the general case, any master can access any slave; not all combinations pass the common sense test, however. Refer to the *MVME1X7P Single Board Computers Programmer's Reference Guide* and to the user's guide for each device to determine its port size, data bus connection, and any restrictions that apply when accessing the device.

Microprocessor

The MC68060 processor is used on the MVME177P. The MC68060 has on-chip instruction and data caches and a floating-point processor. Refer to the MC68060 user's manual for more information.

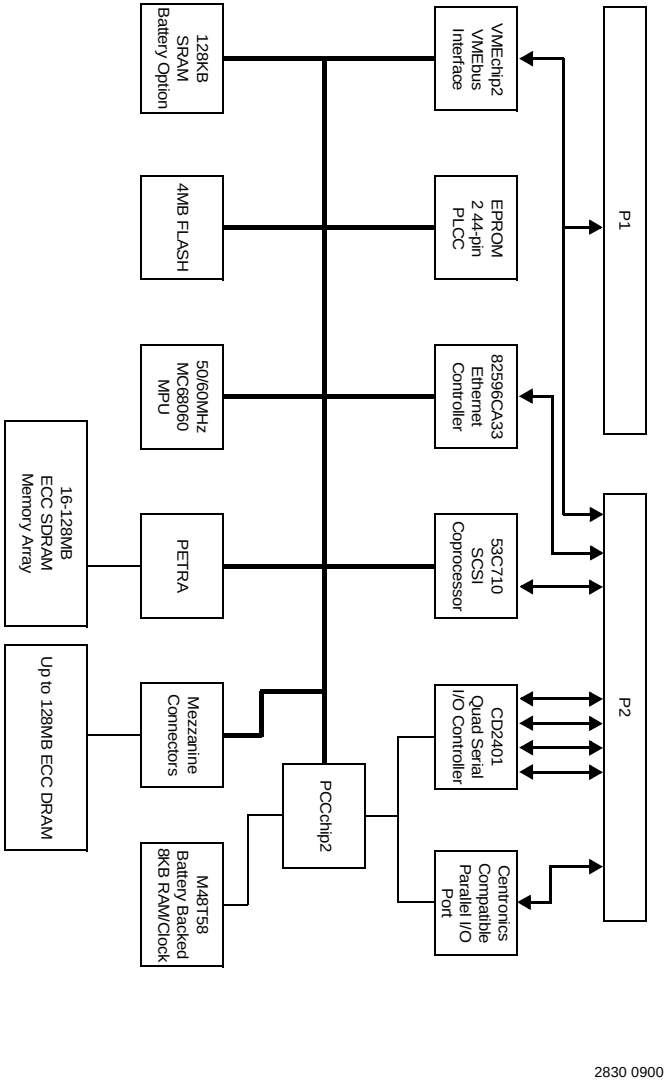


Figure 4-1. MVME177P Block Diagram

Memory Options

The following memory options are available on the different versions of MVME177P boards.

DRAM

MVME177P boards are built with 16MB, 32MB, 64MB, or 128MB synchronous DRAM (SDRAM). The MVME177P may have the SDRAM configured to model 4MB, 8MB, 16MB, 32MB, 64MB, or 128MB of ECC-protected DRAM.

The SDRAM memory array itself is always a single-bit error correcting and multi-bit error detection memory, irrespective of which interface model you use to access the SDRAM.

For specifics on SDRAM performance and for detailed programming information, refer to the chapters on MCECC memory controller emulations in the *MVME1X7P Single Board Computer Programmer's Reference Guide*.

SRAM

The MVME177P implementation includes 128KB SRAM (static RAM). SRAM architecture is single non-interleaved. SRAM performance is described in the section on the SRAM memory interface in the *MVME1X7P Single Board Computer Programmer's Reference Guide.* Battery backup options are selected via jumper header J9.

EPROMs

There are two 44-pin PLCC/CLCC EPROM sockets for SGS-Thompson M27C4002 (256K x 16) or AMD 27C4096 type EPROMs. They are organized as one 32-bit wide bank that supports 8-, 16-, and 32-bit read accesses.

The EPROMs as shipped are normally used for the onboard debugger firmware (177Bug), but can be used to download user code to Flash. The EPROMs may occupy 2MB of memory over two banks. The second bank can be used as 2MB of Flash memory in mixed mode. The EPROMs occupy only 1MB in the ROM space in mixed mode and are repeated in

the second 1MB space (which is reserved for future expansion). The EPROMs may either coexist with this 2MB of Flash, or can be used to program all 4MB of Flash (after which configuration switch S4 could be reset to make only Flash available).

After a system reset, the EPROMs are mapped to the default addresses $00000 through $FFFFF. They may be mapped to $FF800000 through $FF8FFFFF if necessary. The selection between mapping EPROM/Flash mixed mode or all-Flash mode is done by the combination of board configuration switch S4 and VMEchip2 control bit GPIO2. Table 4-2 shows how the “EPROM/Flash” switch and GPIO bit 2 control the EPROM/Flash configuration.

The EPROMs are mapped to local bus address 0 following a local bus reset. This allows the MC68060 to access the stack pointer and execution address following a reset. The EPROMs are controlled by the VMEchip2 ASIC. The map decoder, the access time, and the time they appear at address 0 are all programmable items. For more detail, refer to the VMEchip2 description in the *Programmer’s Reference Guide*.

Flash Memory

The MVME177 includes four 28F008SA Flash memory devices. The Flash devices provide 4MB of ROM at address $FF800000-$FFBFFFFF. The Flash memory is organized as one 32-bit bank for 32-bit code execution from the processor. The Flash can be used for storage of the onboard debugger firmware (177Bug) which could be downloaded from I/O resources such as Ethernet, SCSI or serial devices, or the VMEbus.

When Flash is used with EPROM, either the top or bottom 2MB of Flash is available in the second 2MB of memory space after the EPROM. Refer to Table 4-2 below.

Because only 1M x 8-bit Flash chips are used, no jumper or switch configuration is necessary to select the Flash chip size.

The memory map for the Flash devices is under the control of the VMEchip2 ASIC. The 32-bit wide Flash can support 8-, 16-, and 32-bit read accesses.

Table 4-2. EPROM/Flash Control and Configuration

Switch S4 Segment 2	VMEchip2 bit GPIO2	Memory Configuration
ON	Low	2MB EPROM (lower) and 2MB Flash (upper). First 2MB Flash accessible (Note).
ON	High	2MB EPROM (lower) and 2MB Flash (upper). Second 2MB Flash accessible (Note).
OFF	N/A	All 4MB Flash.

Note These 2MB of Flash will follow the EPROMs in memory if S4 segment 2 is set to OFF. The Flash may be read-only or read/write, depending on the status of Flash write protection (see below).

Flash write protection is programmable through the VMEchip2 GPIO register. The address map location of Flash is at $000000 through $3FFFFF at local reset if switch S4 segment 2 is set to OFF, providing for the all-Flash mode. In the mixed EPROM/Flash mode, half of the Flash is accessible at addresses $200000 through $3FFFFF, depending on the state of the VMEchip2 GPIO2 control bit.

Because the MVME177 uses 1M x 8-bit Flash memory devices and EPROMs with no download ROM, the software programs the VMEchip2 ROM0 and REV EROM bits properly so that the Flash/EPROM appears at address $0 after powerup. The hardware is implemented so that the EPROM/Flash appears at address $00000000 following a local bus reset.

The MVME177 implements Flash write protection by setting or clearing a control bit (GPIO1) in the VMEchip2 GPIO register, to enable writes by the software after the download/programming process is complete.

Battery-Backed-Up RAM and Clock

An M48T58 RAM and clock chip is used on the MVME177P. This chip provides a time-of-day clock, oscillator, crystal, power fail detection, memory write protection, 8KB of RAM, and a battery in one 28-pin

package. The clock provides seconds, minutes, hours, day, date, month, and year in BCD 24-hour format. Corrections for 28-, 29- (leap year), and 30-day months are made automatically. No interrupts are generated by the clock. Although the M48T58 is an 8-bit device, the interface provided by the PCCchip2 ASIC supports 8-, 16-, and 32-bit accesses to the M48T58. Refer to the PCCchip2 description in the *Programmer's Reference Guide* and to the M48T58 data sheet for detailed programming guidance and battery life information.

VMEbus Interface and VMEchip2

The VMEchip2 ASIC provides the local-bus-to-VMEbus interface, the VMEbus-to-local-bus interface, and the DMA controller functions of the local VMEbus. The VMEchip2 also provides the VMEbus system controller functions. Refer to the VMEchip2 description in the *Programmer's Reference Guide* for detailed programming information.

I/O Interfaces

The MVME177P provides onboard I/O for many system applications. The I/O functions include serial ports, printer port, Ethernet transceiver interface, and SCSI mass storage interface.

Serial Port Interface

The CD2401 serial controller chip (SCC) is used to implement the four serial ports. The serial ports support standard baud rates (110 to 38.4K baud). The four serial ports differ functionally because of the limited number of pins on the P2 I/O connector. Serial port 1 is a minimum function asynchronous port. It uses RXD, CTS, TXD, and RTS. Serial ports 2 and 3 are full function asynchronous ports. They use RXD, CTS, DCD, TXD, RTS, and DTR. Serial port 4 is a full function asynchronous or synchronous port. It can operate at synchronous bit rates up to 64 k bits per second. It uses RXD, CTS, DCD, TXD, RTS, and DTR. It also interfaces to the synchronous clock signal lines. Refer to the *Programmer's Reference Guide* for drawings of the serial port interface connections.

All four serial ports use EIA-232-D drivers and receivers located on the main board, and all the signal lines are routed to the P2 I/O connector. The configuration headers are located on the main board and may be on some transition boards. An external I/O transition board is necessary to convert the I/O connector pinout to industry-standard connectors.

Note The MVME177P board hardware ties the DTR signal from the CD2401 to the pin labeled RTS at connector P2. Likewise, RTS from the CD2401 is tied to DTR on P2. Therefore, when programming the CD2401, assert DTR when you want RTS, and RTS when you want DTR.

The interface provided by the PCCchip2 ASIC allows the 16-bit CD2401 to appear at contiguous addresses; however, accesses to the CD2401 must be 8 or 16 bits. 32-bit accesses are not permitted. Refer to the CD2401 data sheet and to the PCCchip2 description in the *Programmer's Reference Guide* for detailed programming information.

The CD2401 supports DMA operations to local memory. Because the CD2401 does not support a retry operation necessary to break VMEbus lockup conditions, the CD2401 DMA controllers should not be programmed to access the VMEbus. The hardware does not restrict the CD2401 to onboard DRAM.

Parallel Port Interface

The PCCchip2 ASIC provides an 8-bit bidirectional parallel port. All eight bits of the port must be either inputs or outputs (no individual selection). In addition to the 8 bits of data, there are two control pins and five status pins. Each of the status pins can generate an interrupt to the MPU in any of the following programmable conditions: high level, low level, high-to-low transition, or low-to-high transition. This port may be used as a Centronics-compatible parallel printer port or as a general parallel I/O port.

When used as a parallel printer port, the five status pins function as: Printer Acknowledge (ACK), Printer Fault (FAULT∗), Printer Busy (BSY), Printer Select (SELECT), and Printer Paper Error (PE); while the control pins act as Printer Strobe (STROBE∗), and Input Prime (INP∗).

The PCCchip2 provides an auto-strobe feature similar to that of the MVME147 PCC. In auto-strobe mode, after a write to the Printer Data Register, the PCCchip2 automatically asserts the STROBE∗ pin for a selected time specified by the Printer Fast Strobe control bit. In manual mode, the Printer Strobe control bit directly controls the state of the STROBE∗ pin.

Refer to the *Programmer's Reference Guide* for drawings of the printer port interface connections.

Ethernet Interface

The MVME177P uses the Intel 82596CA LAN coprocessor to implement the optional Ethernet transceiver interface. The 82596CA accesses local RAM using DMA operations to perform its normal functions. Because the 82596CA has small internal buffers and the VMEbus has an undefined latency period, buffer overrun may occur if the DMA is programmed to access the VMEbus. Therefore, the 82596CA should not be programmed to access the VMEbus.

Every MVME177P that is built with an Ethernet interface is assigned an Ethernet Station Address. The address is $0001AF*xxxxxx* where *xxxxxx* is the unique 6-nibble number assigned to the board (i.e., every MVME177P has a different value for *xxxxxx*).

Each board has an Ethernet Station Address displayed on a label attached to the VMEbus P2 connector. In addition, the six bytes including the Ethernet address are stored in the BBRAM configuration area. That is, 0001AF*xxxxxx* is stored in the BBRAM. The upper four bytes (0001AF*xx*) are read at $FFFC1F2C; the lower two bytes (*xxxx*) are read at $FFFC1F30. The MVME177P debugger has the capability to retrieve or set the Ethernet address.

If the data in BBRAM is lost, use the number on the label on backplane connector P2 to restore it.

The Ethernet transceiver interface is located on the MVME177P main board, and the industry-standard DB15 connector is located on the MVME712 series transition board.

Support functions for the 82596CA LAN coprocessor are provided by the PCCchip2 ASIC. Refer to the 82596CA user's guide and to the *Programmer's Reference Guide* for detailed programming information.

SCSI Interface

The MVME177P has provision for mass storage subsystems through the industry-standard SCSI bus. These subsystems may include hard and floppy disk drives, streaming tape drives, and other mass storage devices. The SCSI interface is implemented using the NCR 53C710 SCSI I/O controller.

Support functions for the 53C710 are provided by the PCCchip2 ASIC. Refer to the NCR 53C710 user's guide and to the PCCchip2 description in the *Programmer's Reference Guide* for detailed programming information.

SCSI Termination

It is important that the SCSI bus be properly terminated at both ends.

In the case of the MVME177P, sockets are provided for terminators on the P2 or LCP2 adapter board. If the SCSI bus ends at the adapter board, termination resistors must be installed on the adapter board. +5V power to the SCSI bus TERM power line and termination resistors is supplied through a fuse located on the adapter board.

Local Resources

The MVME177P includes many resources for the local processor. These include tick timers, software-programmable hardware interrupts, a watchdog timer, and a local bus timeout.

Programmable Tick Timers

Four 32-bit programmable tick timers with 1µs resolution are available: two in the VMEchip2 ASIC and two in the PCCchip2 ASIC. The tick timers may be programmed to generate periodic interrupts to the processor. Refer to the VMEchip2 and PCCchip2 descriptions in the *Programmer's Reference Guide* for detailed programming information.

Watchdog Timer

A watchdog timer function is provided in the VMEchip2 ASIC. When the watchdog timer is enabled, it must be reset by software within the programmed interval or it times out. The watchdog timer can be programmed to generate a SYSRESET signal, a local reset signal, or a board fail signal if it times out. Refer to the VMEchip2 description in the *Programmer's Reference Guide* for detailed programming information.

Software-Programmable Hardware Interrupts

The VMEchip2 ASIC supplies eight software-programmable hardware interrupts. These interrupts allow software to create a hardware interrupt. Refer to the VMEchip2 description in the *Programmer's Reference Guide* for detailed programming information.

Local Bus Timeout

The MVME177P provides a timeout function in the VMEchip2 ASIC for the local bus. When the timer is enabled and a local bus access times out, a Transfer Error Acknowledge (TEA) signal is sent to the local bus master. The timeout value is selectable by software for 8 µsec, 64 µsec, 256 µsec, or infinity. The local bus timer does not operate during VMEbus bound cycles. VMEbus bound cycles are timed by the VMEbus access timer and the VMEbus global timer. Refer to the VMEchip2 description in the *Programmer's Reference Guide* for detailed programming information.

Local Bus Arbiter

The local bus arbiter implements a fixed priority (see Table 4-3).

Table 4-3. Local Bus Arbitration Priority

Device	Priority	Note
LAN	0	Highest
Serial I/O	1	
SCSI	2	...
VMEbus	3	Next Lowest
MC68060 MPU	4	Lowest

Connectors

The MVME177P has two 96-position DIN connectors: P1 and P2. P1 rows A, B, C, and P2 row B provide the VMEbus interconnection. P2 rows A and C provide the connection to the SCSI bus, serial ports, and Ethernet.

Pin assignments for the VME connectors on the MVME177P are listed in Chapter 5.

Remote Status and Control

The remote status and control connector, J3, is a 20-pin connector located behind the front panel of the MVME177P. It provides system designers with flexibility in accessing critical indicator and reset functions. When the board is enclosed in a chassis and the front panel is not visible, this connector allows the Reset, Abort, and LED functions to be extended to the control panel of the system, where they are visible. Alternatively, this allows a system designer to construct a **RESET**/**ABORT**/LED panel that can be located remotely from the MVME177P.

Pin Assignments

5

Connector Pin Assignments

This chapter summarizes the pin assignments for the following groups of interconnect signals on the MVME177P:

Connector	Location	Table
Remote Reset connector	J3	Table 5-1
VMEbus connector P1	P1	Table 5-2
VMEbus connector P2	P2	Table 5-3

The tables in this chapter furnish pin assignments only. For detailed descriptions of the interconnect signals, consult the support information for the MVME177P (available through your Motorola sales office).

Remote Reset Connector - J3

The MVME177P has a 20-pin connector (J3) mounted behind the front panel. When the MVME177P board is enclosed in a chassis and the front panel is not visible, this connector enables you to extend the reset, abort and LED functions to the control panel of the system, where they remain accessible.

Table 5-1. Remote Reset Connector J3 Pin Assignments

1	+5V Fused	LANLED*	2
3	+12VLED*	SCSILED*	4
5	VMELED*	Pullup	6
7	RUNLED*	STSLED*	8
9	FAILSTAT*	No connection	10
11	SCONLED*	ABORTSW*	12
13	RESETSW*	GND	14
15	GND	Pullup	16
17	No connection	Pullup	18
19	PCCGPIO1	GND	20

VMEbus Connectors - P1, P2

Two three-row 96-pin DIN type connectors, P1 and P2, supply the interface between the base board and the VMEbus. P1 provides power and VME signals for 24-bit addressing and 16-bit data. Its pin assignments are set by the IEEE P1014-1987 VMEbus Specification. P2 Row B supplies the base board with power, with the upper 8 VMEbus address lines, and with an additional 16 VMEbus data lines. P2 rows A and C are not used in the MVME177P implementation. The pin assignments for P1and P2 are listed in Table 5-2 and Table 5-3 respectively.

Table 5-2. VMEbus Connector P1 Pin Assignments

	Row A	Row B	Row C	
1	VD0	VBBSY*	VD8	1
2	VD1	VBCLR*	VD9	2
3	VD2	VACFAIL*	VD10	3
4	VD3	VBGIN0*	VD11	4
5	VD4	VBGOUT0*	VD12	5
6	VD5	VBGIN1*	VD13	6
7	VD6	VBGOUT1*	VD14	7
8	VD7	VBGIN2*	VD15	8
9	GND	VBGOUT2*	GND	9
10	VSYSCLK	VBGIN3*	VSYSFAIL*	10
11	GND	VBGOUT3*	VBERR*	11
12	VDS1*	VBR0*	VSYSRESET*	12
13	VDS0*	VBR1*	VLWORD*	13
14	VWRITE*	VBR2*	VAM5	14
15	GND	VBR3*	VA23	15
16	VDTACK*	VAM0	VA22	16
17	GND	VAM1	VA21	17
18	VAS*	VAM2	VA20	18
19	GND	VAM3	VA19	19
20	VIACK*	GND	VA18	20
21	VIACKIN*	Not Used	VA17	21
22	VIACKOUT*	Not Used	VA16	22
23	VAM4	GND	VA15	23
24	VA7	VIRQ7*	VA14	24
25	VA6	VIRQ6*	VA13	25
26	VA5	VIRQ5*	VA12	26
27	VA4	VIRQ4*	VA11	27
28	VA3	VIRQ3*	VA10	28
29	VA2	VIRQ2*	VA9	29
30	VA1	VIRQ1*	VA8	30
31	–12V	P5VSTDBY	+12V	31
32	+5V	+5V	+5V	32

Table 5-3. VMEbus Connector P2 Pin Assignment

	Row A	Row B	Row C	
1	DB0*	+5V	C–	1
2	DB1*	GND	C+	2
3	DB2*	Not Used	T–	3
4	DB3*	VA24	T+	4
5	DB4*	VA25	R–	5
6	DB5*	VA26	R+	6
7	DB6*	VA27	P12VLAN	7
8	DB7*	VA28	No Connection	8
9	DBP*	VA29	No Connection	9
10	ATN*	VA30	No Connection	10
11	BSY*	VA31	No Connection	11
12	ACK*	GND	No Connection	12
13	RST*	+5V	No Connection	13
14	MSG*	VD16	No Connection	14
15	SEL*	VD17	No Connection	15
16	DC*	VD18	No Connection	16
17	REQ*	VD19	No Connection	17
18	OI*	VD20	DBPIN14	18
19	DBPIN16	VD21	DBPIN18	19
20	DSRB	VD22	DBPIN19	20
21	DBPIN21	VD23	DBPIN9	21
22	DBPIN22	GND	DBPIN10	22
23	DBPIN23	VD24	DBPIN11	23
24	TXCOB	VD25	DBPIN12	24
25	TXDB	VD26	DBPIN25	25
26	RXDB	VD27	DBPIN13	26
27	RTSB	VD28	RXDA	27
28	RXCB	VD29	TXDA	28
29	CTSB	VD30	CTSA	29
30	DTRB	VD31	RTSA	30
31	DCDB	GND	DCDA	31
32	TXCB	+5V	DTRA	32

Board Specifications

The following table lists the general specifications for the MVME177P VME single-board computer. The subsequent sections detail cooling requirements and EMC regulatory compliance.

A complete functional description of the MVME177P boards appears in Chapter 4.

Table A-1. MVME177P Specifications

Characteristics		Specifications
Power requirements	+5Vdc (±5%), 1.75A typical, 2.0A maximum +12 Vdc (± 5%), 1A maximum –12 Vdc (± 5%), 100 mA typical	
Operating temperature	–5°C to 55°C exit air with forced-air cooling	
Storage temperature	–40°C to +85° C	
Relative humidity	5% to 90% (noncondensing)	
Vibration (operating)	2 Gs RMS, 20Hz-2000Hz random	
Altitude (operating)	5000 meters (16,405 feet)	
Physical dimensions (base board only)	Height	Double-high VME board, 9.2 in. (233 mm)
	Front panel width	0.8 in. (20 mm)
	Front panel height	10.3 in. (262 mm)
	Depth	6.3 in. (160 mm)

Cooling Requirements

The Motorola MVME177P VME Embedded Controller is specified, designed, and tested to operate reliably with an incoming air temperature range from –5° to 55° C (23° to 131° F) with forced air cooling of the entire assembly (base board and mezzanine, if present) at a velocity typically achievable by using a 100 CFM axial fan. Temperature qualification is performed in a standard Motorola VME system chassis. Twenty-five-watt load boards are inserted in two card slots, one on each side, adjacent to the board under test, to simulate a high power density system configuration. An assembly of three axial fans, rated at 100 CFM per fan, is placed directly under the VME card cage. The incoming air temperature is measured between the fan assembly and the card cage, where the incoming airstream first encounters the module under test. Test software is executed as the module is subjected to ambient temperature variations. Case temperatures of critical, high power density integrated circuits are monitored to ensure that component vendors' specifications are not exceeded.

While the exact amount of airflow required for cooling depends on the ambient air temperature and the type, number, and location of boards and other heat sources, adequate cooling can usually be achieved with 10 CFM and 490 LFM flowing over the module. Less airflow is required to cool the module in environments having lower maximum ambients. Under more favorable thermal conditions, it may be possible to operate the module reliably at higher than 55° C with increased airflow. It is important to note that there are several factors, in addition to the rated CFM of the air mover, which determine the actual volume and speed of air flowing over a module.

Solving Startup Problems

In the event of difficulty with your MVME177P VME embedded controller, try the simple troubleshooting steps on the following pages before calling for help or sending the board back for repair. Some of the procedures will return the board to the factory debugger environment. (The board was tested under these conditions before it left the factory.) The self-tests may not run in all user-customized environments.

Table B-1. Troubleshooting MVME177P Boards

Condition	Possible Problem	Try This:
I. Nothing works, no display on the terminal.	A. If the **RUN** (or **+12V**) LED is not lit, the board may not be getting correct power.	1. Make sure the system is plugged in. 2. Check that the board is securely installed in its backplane or chassis. 3. Check that all necessary cables are connected to the board, per this manual. 4. Check for compliance with System Considerations, as described in this manual. 5. Review the Installation and Startup procedures, as described in this manual. They include a step-by-step powerup routine. Try it.
	B. If the LEDs are lit, the board may be in the wrong slot.	1. For VMEmodules, the processor module (controller) should be in the first (leftmost) slot. 2. Also check that the "system controller" function on the board is enabled, per this manual.
	C. The "system console" terminal may be configured incorrectly.	Configure the system console terminal as described in this manual.

Table B-1. Troubleshooting MVME177P Boards (Continued)

Condition	Possible Problem	Try This:
II. There is a display on the terminal, but input from the keyboard has no effect.	A. The keyboard may be connected incorrectly.	Recheck the keyboard connections and power.
	B. Board jumpers or switches may be configured incorrectly.	Verify the settings of the board jumpers and configuration switches as described in this manual.
	C. You may have invoked flow control by pressing a HOLD or PAUSE key, or by typing**:** **<CTRL>-S**	Press the HOLD or PAUSE key again. If this does not free up the keyboard, type in: **<CTRL>-Q**
III. Debug prompt `177-Bug>` does not appear at powerup, and the board does not autoboot.	A. Debugger EPROM/Flash may be missing.	1. Disconnect *all* power from your system. 2. Check that the proper debugger device is installed. 3. Set J1 segment 5 to **OFF** (remove the jumper). This enables use of the secondary EPROM. 4. Reconnect power. 5. Restart the system by "double-button reset": press the **RESET** and **ABORT** switches at the same time; release **RESET** first, wait seven seconds, then release **ABORT**. 6. If the debug prompt appears, go to step IV or step V, as indicated. If the debug prompt does not appear, go to step VI.
	B. The board may need to be reset.	
IV. Debug prompt `177-Bug>` appears at powerup, but the board does not autoboot.	A. The initial debugger environment parameters may be set incorrectly.	1. Start the onboard calendar clock and timer. Type: **set *mmddyyhhmm* <CR>** where the characters indicate the month, day, year, hour, and minute. The date and time will be displayed.
	B. There may be some fault in the board hardware.	 **Caution** Performing the next step (**env;d**) will change some parameters that may affect your system's operation. (continues>)

Table B-1. Troubleshooting MVME177P Boards (Continued)

Condition	Possible Problem	Try This:
IV. *Continued*		2. At the command line prompt, type in: **env;d <CR>** This restores the default parameters for the debugger environment. 3. When prompted to Update Non-Volatile RAM, type in: **y <CR>** 4. When prompted to Reset Local System, type in: **y <CR>** 5. After the clock speed is displayed, immediately (within five seconds) press the Return key: **<CR>** or **BREAK** to exit to the System Menu. Then enter a 3 for "Go to System Debugger" and Return: **3 <CR>** Now the prompt should be: `177-Diag>` 6. You may need to use the **cnfg** command (see your board Debugger Manual) to change clock speed and/or Ethernet Address, and then later return to: **env <CR>** and step 3. 7. Run the selftests by typing in: **st <CR>** The tests take as long as 10 minutes, depending on RAM size. They are complete when the prompt returns. (The onboard self-test is a valuable tool in isolating defects.) 8. The system may indicate that it has passed all the self-tests. Or, it may indicate a test that failed. If neither happens, enter: **de <CR>** Any errors should now be displayed. If there are any errors, go to step VI. If there are no errors, go to step V.
V. The debugger is in system mode and the board autoboots, or the board has passed self-tests.	A. No apparent problems — troubleshooting is done.	No further troubleshooting steps are required.

Table B-1. Troubleshooting MVME177P Boards (Continued)

Condition	Possible Problem	Try This:
VI. The board has failed one or more of the tests listed above, and cannot be corrected using the steps given.	A. There may be some fault in the board hardware or the on-board debugging and diagnostic firmware.	1. Document the problem and return the board for service. 2. Phone 1-800-222-5640.
TROUBLESHOOTING PROCEDURE COMPLETE.		

Network Controller Modules Supported

The 177Bug firmware supports the following VMEbus network controller modules. The default address for each module type and position is shown to indicate where the controller must reside to be supported by 177Bug. The controllers are accessed via the specified CLUN and DLUNs listed here. The CLUN and DLUNs are used in conjunction with the debugger commands **NBH**, **NBO**, **NIOP**, **NIOC**, **NIOT**, **NPING**, and **NAB**; they are also used with the debugger system calls .NETRD, .NETWR, .NETFOPN, .NETFRD, .NETCFIG, and .NETCTRL.

Controller Type	CLUN	DLUN	Address	Interface Type
MVME177	$00	$00	$FFF46000	Ethernet
MVME376	$02	$00	$FFFF1200	Ethernet
MVME376	$03	$00	$FFFF1400	Ethernet
MVME376	$04	$00	$FFFF1600	Ethernet
MVME376	$05	$00	$FFFF5400	Ethernet
MVME376	$06	$00	$FFFF5600	Ethernet
MVME376	$07	$00	$FFFFA400	Ethernet
MVME374	$10	$00	$FF000000	Ethernet
MVME374	$11	$00	$FF100000	Ethernet
MVME374	$12	$00	$FF200000	Ethernet
MVME374	$13	$00	$FF300000	Ethernet
MVME374	$14	$00	$FF400000	Ethernet
MVME374	$15	$00	$FF500000	Ethernet

C

Controller Modules Supported

The following VMEbus disk/tape controller modules are supported by the 177Bug firmware. The default address for each controller type is First Address. The controller can be addressed by First CLUN during execution of the **BH**, **BO**, or **IOP** commands, or during execution of the .DSKRD or .DSKWR TRAP #15 calls. Note that if another controller of the same type is used, the second one must have its address changed by its onboard jumpers and/or switches, so that it matches Second Address and can be called up by Second CLUN.

Controller Type	First CLUN	First Address	Second CLUN	Second Address
CISC Embedded Controller	$00 (Note 1)	--	--	--
MVME320 - Winchester/Floppy Controller	$11 (Note 2)	$FFFFB000	$12 (Note 2)	$FFFFAC00
MVME323 - ESDI Winchester Controller	$08	$FFFFA000	$09	$FFFFA200
MVME327A - SCSI Controller	$02	$FFFFA600	$03	$FFFFA700
MVME328 - SCSI Controller	$06	$FFFF9000	$07	$FFFF9800
MVME328 - SCSI Controller	$16	$FFFF4800	$17	$FFFF5800
MVME328 - SCSI Controller	$18	$FFFF7000	$19	$FFFF7800
MVME350 - Streaming Tape Controller	$04	$FFFF5000	$05	$FFFF5100

Notes:

1. If an MVME177P with an SCSI port is used, the MVME177P module has CLUN 0.
2. For MVME177Ps, the first MVME320 has CLUN $11; the second MVME320 has CLUN $12.

Default Configurations

Note SCSI Common Command Set (CCS) devices are the only ones tested by Motorola Computer Group.

CISC Embedded Controllers -- 7 Devices

Controller LUN	Address	Device LUN	Device Type
0	$*XXXXXXXX*	00 10 20 30 40 50 60	SCSI Common Command Set (CCS), which may be any of these: - Fixed direct access - Removable flexible direct access (TEAC style) - CD-ROM - Sequential access

MVME320 -- 4 Devices

Controller LUN	Address	Device LUN	Device Type
11	$FFFFB000	0	Winchester hard drive
		1	Winchester hard drive
12	$FFFFAC00	2	5-1/4" DS/DD 96 TPI floppy drive
		3	5-1/4" DS/DD 96 TPI floppy drive

MVME323 -- 4 Devices

Controller LUN	Address	Device LUN	Device Type
8	$FFFFA000	0	ESDI Winchester hard drive
		1	ESDI Winchester hard drive
9	$FFFFA200	2	ESDI Winchester hard drive
		3	ESDI Winchester hard drive

MVME327A -- 9 Devices

Controller LUN	Address	Device LUN	Device Type
2	$FFFFA600	00 10 20 30 40 50 60	SCSI Common Command Set (CCS), which may be any of these: - Fixed direct access - Removable flexible direct access (TEAC style) - CD-ROM - Sequential access
3	$FFFFA700	80	Local floppy drive
		81	Local floppy drive

MVME328 -- 14 Devices

Controller LUN	Address	Device LUN	Device Type
6	$FFFF9000	00 08 10 18 20 28 30	SCSI Common Command Set (CCS), which may be any of these: - Removable flexible direct access (TEAC style) - CD-ROM - Sequential access
7	$FFFF9800		
16	$FFFF4800		
17	$FFFF5800	40 48 50 58 60 68 70	Same as above, but these will only be available if the daughter card for the second SCSI channel is present.
18	$FFFF7000		
19	$FFFF7800		

MVME350 -- 1 Device

Controller LUN	Address	Device LUN	Device Type
4	$FFFF5000	0	QIC-02 streaming tape drive
5	$FFFF5100		

IOT Command Parameters

The following table lists the proper **IOT** command parameters for floppies used with boards such as the MVME328 and MVME177P.

IOT Parameter	Floppy Types and Formats						
	DSDD5	**PCXT8**	**PCXT9**	**PCXT9_3**	**PCAT**	**PS2**	**SHD**
Sector Size 0- 128 1- 256 2- 512 3-1024 4-2048 5-4096 =	1	2	2	2	2	2	2
Block Size: 0- 128 1- 256 2- 512 3-1024 4-2048 5-4096 =	1	1	1	1	1	1	1
Sectors/Track	10	8	9	9	F	12	24
Number of Heads =	2	2	2	2	2	2	2
Number of Cylinders =	50	28	28	50	50	50	50
Precomp. Cylinder =	50	28	28	50	50	50	50
Reduced Write Current Cylinder =	50	28	28	50	50	50	50
Step Rate Code =	0	0	0	0	0	0	0
Single/Double DATA Density =	D	D	D	D	D	D	D
Single/Double TRACK Density =	D	D	D	D	D	D	D
Single/Equal_in_all Track Zero Density =	S	E	E	E	E	E	E
Slow/Fast Data Rate =	S	S	S	S	F	F	F
Other Characteristics							
Number of Physical Sectors	0A00	0280	02D0	05A0	0960	0B40	1680
Number of Logical Blocks (100 in size)	09F8	0500	05A0	0B40	12C0	1680	2D00
Number of Bytes in Decimal	653312	327680	368460	737280	1228800	1474560	2949120
Media Size/Density	5.25/DD	5.25/DD	5.25/DD	3.5/DD	5.25/HD	3.5/HD	3.5/ED

Notes

1. All numerical parameters are in hexadecimal unless otherwise noted.
2. The DSDD5 type floppy is the default setting for the debugger.

Related Documentation

E

MCG Documents

The Motorola Computer Group publications listed below are referenced in this manual. You can obtain paper or electronic copies of MCG publications by:

- Contacting your local Motorola sales office
- Visiting MCG's World Wide Web literature site, http://www.motorola.com/computer/literature

Table E-1. Motorola Computer Group Documents

Document Title	Motorola Publication Number
MVME1X7P Single Board Computers Programmer's Reference Guide	V1X7PA/PG
MVME177Bug Debugging Package User's Manual	MVME177BUG
Debugging Package for Motorola 68K CISC CPUs User's Manual (Parts 1 and 2)	68KBUG1/D 68KBUG2/D
Single Board Computers SCSI Software User's Manual	SBCSCSI/D
MVME712M Transition Module and P2 Adapter Board Installation and Use	VME712MA/IH
MVME712-12, MVME712-13, MVME712A, MVME712AM, and MVME712B Transition Modules and LCP2 Adapter Board User's Manual	MVME712A/D

To locate and view the most up-to-date product information in PDF or HTML format, visit http://www.motorola.com/computer/literature.

Manufacturers' Documents

For additional information, refer to the following table for manufacturers' data sheets or user's manuals. As a further help, sources for the listed documents are also provided. Please note that in many cases, the information is preliminary and the revision levels of the documents are subject to change without notice.

Table E-2. Manufacturers' Documents

Document Title and Source	Publication Number
M68000 Family Reference Manual MC68060 Microprocessor User's Manual Literature Distribution Center for Motorola Telephone: 1-800- 441-2447 FAX: (602) 994-6430 or (303) 675-2150 E-mail: ldcformotorola@hibbertco.com Web: http://www.mot.com/SPS	M68000FR M68060UM
82596CA Local Area Network Coprocessor Data Sheet 82596CA Local Area Network Coprocessor User's Manual 28F016SA Flash Memory Data Sheet Intel Corporation Web: http://developer.intel.com/design	290218 296853 209435
SYM 53C710 (was NCR 53C710) SCSI I/O Processor Data Manual SYM 53C710 (was NCR 53C710) SCSI I/O Processor Programmer's Guide Symbios Logic Inc. 1731 Technology Drive, Suite 600 San Jose, CA 95110 NCR Managed Services Center — Telephone: 1-800-262-7782 Web: http://www.lsilogic.com/products/symbios	NCR53C710DM NCR53C710PG
M48T58(B) TIMEKEEPER™ and 8K x 8 Zeropower™ RAM Data Sheet SGS-Thomson Microelectronics Group Marketing Headquarters (or nearest Sales Office) 1000 East Bell Road Phoenix, Arizona 85022 Telephone: (602) 867-6100 Web: http://www.st.com/stonline/books	M48T58

Table E-2. Manufacturers' Documents (Continued)

Document Title and Source	Publication Number
Z85230 Serial Communications Controller Product Brief Zilog Inc. 210 Hacienda Avenue Campbell, CA 95008-6609 Web: http://www.zilog.com/products	Z85230pb.pdf

Related Specifications

For additional information, refer to the following table for manufacturers' data sheets or user's manuals. As a further help, sources for the listed documents are also provided. Please note that in many cases, the information is preliminary and the revision levels of the documents are subject to change without notice.

Table E-3. Related Specifications

Document Title and Source	Publication Number
VME64 Specification VITA (VMEbus International Trade Association) 7825 E. Gelding Drive, Suite 104 Scottsdale, AZ 85260 Telephone: (602) 951-8866 Web: http://www.vita.com	ANSI/VITA 1-1994
NOTE: An earlier version of the VME specification is available as: Versatile Backplane Bus: VMEbus Institute of Electrical and Electronics Engineers, Inc. Publication and Sales Department 345 East 47th Street New York, New York 10017-21633 Telephone: 1-800-678-4333	 ANSI/IEEE Standard 1014-1987

Table E-3. Related Specifications (Continued)

Document Title and Source	Publication Number
OR Microprocessor system bus for 1 to 4 byte data Bureau Central de la Commission Electrotechnique Internationale 3, rue de Varembé Geneva, Switzerland	IEC 821 BUS
ANSI Small Computer System Interface-2 (SCSI-2), Draft Document X3.131-198X, Revision 10c Global Engineering Documents 15 Inverness Way East Englewood, CO 80112-5704	X3.131-198X Rev. 10c
Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange (EIA-232-D) Global Engineering Documents Suite 400 1991 M Street, NW Washington, DC 20036 Telephone: 1-800-854-7179 Telephone: (303) 397-7956 Web: http://global.ihs.com	ANSI/EIA-232-D Standard

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